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Avoiding Errors in the Analysis of Glass Sand

By J. B. Krak, Technical Editor

When establishing relations with a commercial testing laboratory it is of the greatest importance to ascertain the professional standing and character of the men in charge. The shyster lawyer and the quack doctor find their counterpart in the fake chemist. It is just as necessary to exercise care in the selection of a consulting chemist as it is of any other professional man.

Even if it has been found that the status of the chemist about to be employed is unassailable, he may yet fail to prove entirely satisfactory. The field of chemical analysis, as applied to various industries, is so large that it is impossible for any one man to cover every branch of technology. It goes without saying that a chemical analysis must be correct within certain narrow limits of error, but a manufacturer has a right to demand an interpretation of the analytical results as applied to the use of the substance in his industry. Many manufacturers prefer to interpret results themselves. But as many others, either from lack of time or knowledge, cannot give the figures submitted on the analysis sheet the study which they require for their application. Some otherwise competent chemists fail to render the service which they should give, for the simple reason that they are not well enough acquainted with the needs of the various industries to which they cater. Therefore, it is advisable to employ only men who are specialists.

Since sand is consumed in larger quantities than any other substance used in glass making, there is no raw material whose chemical composition is of greater importance to glass manufacturers. For this reason sand is frequently submitted for chemical analysis.

Although the analysis of a glass sand is a comparatively simple problem, yet it requires a good deal of experience and skill to deal successfully with every variety of sand. The usual procedure to bring the sample in solution is to treat a weighed amount with a mixture of hydrofluoric and sulphuric acids until the silica is completely volatilized. It is of importance to ascertain if any material present in the sand has resisted this treatment. Some varieties of sand may contain staurolite, tourmaline, magnetite or ilmenite, minerals which are not decomposed by treatment with mixed acids. Whenever these are present, the residue must be collected on a small filter and fused with potassium pyrosulphate or sodium carbonate. The fused mass, after cooling, is added to the filtrate and the whole evaporated to dryness.

The estimation of iron, which is the most important determination to be made in a glass sand analysis, offers several chances of error. Frequently a precipitation is made with ammonia. The precipitate is filtered off, ignited, and weighed, and subsequently redissolved and the iron titrated. The amount of the iron oxide found is deducted from the weight of the combined oxides and the difference is called alumina. This method is open to criticism, since the majority of glass sands contain titanium, which usually is not estimated separately. The correct procedure is to test for titanium, preferably through adding a few drops of hydrogen peroxide to the solution of the sample. If titanium is present in appreciable amounts, a yellow color appears. Small amounts of titanium may be estimated by the calorimetric procedure.[1]

Titanium may cause an error in the estimation of iron. It is customary to determine iron by titration with permanganate or bichromate, after first reducing it to the ferrous state. This may be done in various ways: First, by addition of stannous chloride; second, by reduction with zinc or by running the solution through a Jones Reductor; third, by gassing the solution with sulphur dioxide or hydrogen sulphide. Neither one of these methods is entirely proof against error. Reduction with stannous chloride and removal of the excess with mercuric chloride solution is not an accurate procedure for small amounts of iron. Zinc reduces any titanium present, and unless correction is made for its presence, the figure for iron will be too high. Sulphur dioxide and hydrogen sulphide do not reduce titanium, but they must be removed from the solution by heating, which may cause reoxidation of the ferrous oxide, thus rendering the results too low.

Probably the most accurate and at the same time the sim-

[1] Hillebrand. The Analysis of Silicate and Carbonate Rocks. U. S. Geological Survey, Bulletin 700, pp. 154-162.

plest procedure is the potassium iodide method, which can be used for amounts of iron up to 0.10 gram. It may be recalled that this procedure is based on the fact that ferric iron liberates an equivalent amount of iodine from potassium iodide, which is added in excess to the slightly acid solution containing the iron. The iodine is titrated with N/10 thiosulphate solution, using starch solution towards the end of the reaction.

Objection is sometimes made to this method on account of the belief that N/10 thiosulphate solution is unstable and requires frequent standardization. This is contrary to fact. If the solution is prepared with distilled water which has been boiled and cooled just prior to use, it will be found that the solution keeps for months. If protected from carbon dioxide with a soda-lime tube, the solution does not require more frequent checking up than most other standard solutions.

Very small amounts of iron should be determined by the thiocyanate method.[2]

It is difficult to give any hard and fast rules as to the amount of iron permissible in glass sand for the various grades of glass. Much depends on the purity of the other batch ingredients. If they are low in iron, a somewhat higher amount of iron can be tolerated in the sand. Authorities differ somewhat as regards the limits of iron oxide permissible in glass. The following figures are believed to be conservative:

	Per Cent Iron Oxide
Brown bottles	1.0-7.0
Window glass	0.3-0.5
Ordinary plate glass	0.1-0.25
Plate for mirrors	0.05-0.15
Flint bottle	0.05-0.15
Lead flint	0.02-0.03
Crown optical glass	0.03-0.04
Optical glass	0.02-0.03

Sand found at Berkeley Springs, W. Va., runs 0.02 per cent ferric oxide or better, as do some sands found in the Ottawa district, Illinois, and in Pennsylvania. River sands may be low in iron and contain two or three per cent of alumina, which renders them especially valuable for certain grades of glass.

Chemical Analyses of Glass Sands

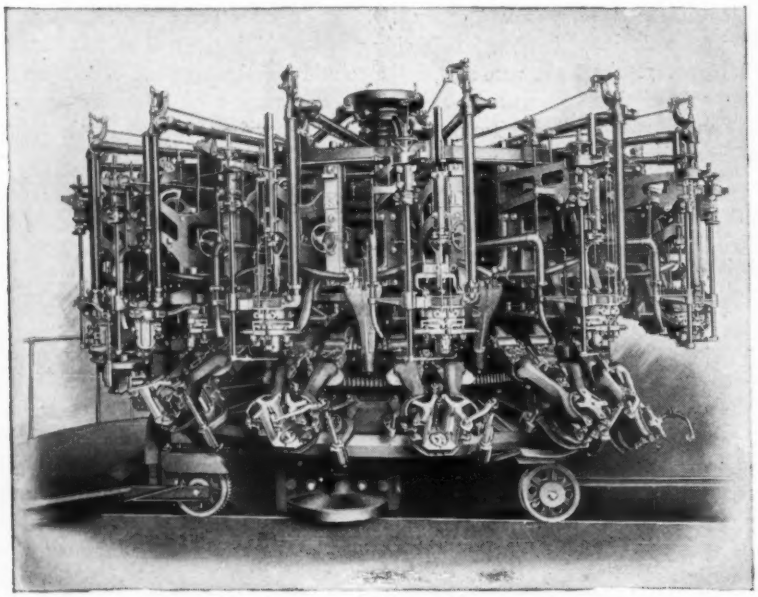
	Silica	Iron Oxide	Alumina	Lime	Magnesia
Hancock, W. Va...	99.30	0.03	0.52	0.08	trace
Greer, W. Va.....	99.55	0.02	0.15	0.08	0.01
Shreveport, La. ...	96.01	0.44	3.12	0.21	0.17
Roff, Okla.	99.58	0.11	0.21	0.04	0.04
Ottawa, Ill.	99.45	—	0.30	0.13	trace
Hanover, N. J	97.71	0.15	0.76	0.96	0.44
Mapleton, Pa.	99.76	0.07	0.14	0.28	—

[2]Scott, Standard Methods of Chemical Analysis, 2nd Edition, p. 222.

The Owens Bottle Machine

By Alfred L. Wagers*

People have traveled great distances, many have come from other countries to see that marvel of the glass industry, the Owens automatic bottle machine. For those who have not had that opportunity, the author has tried in this article to explain in a concise and graphic manner the operation and basic principles of the machine.



THE OWENS AUTOMATIC BOTTLE MACHINE

The "Automatic," or the Owens bottle machine as it is better known, is a continuously revolving, automatic, bottle blowing machine. The speed of the machine varies with the size of bottle being blown.

A fifteen-arm machine, the largest Owens machine now in operation, is made of fifteen similar units mounted in a circle on a revolving frame. Each unit carries its own mold equipment and turns out a bottle with every revolution of the machine. An explanation of the operation of one unit gives an understanding of the operation of the entire machine.

To supply the glass and maintain it at the proper working temperature the Owens process employs what is called a revolving tank. This tank in revolving keeps most of the glass it contains under the furnace, preventing the glass from chilling at the opening over which the blank molds of the machine pass.

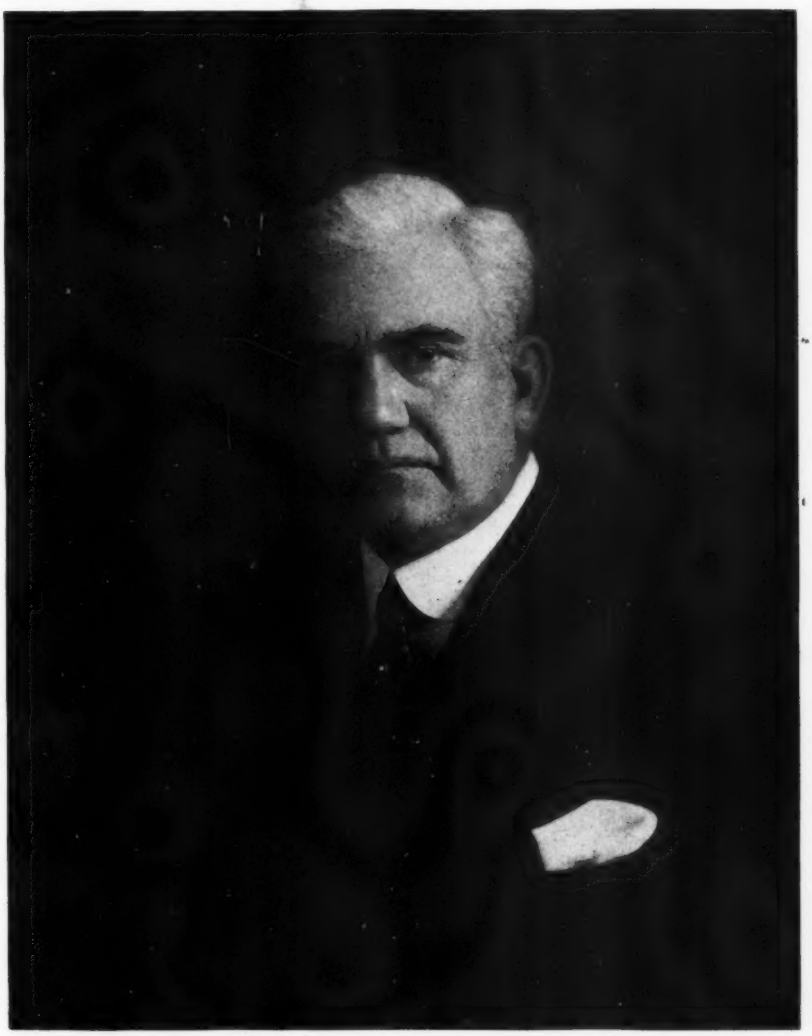
The mold equipment of a unit consists of: The blank or measuring mold, the blow mold or finishing mold, the neck

*The Owens Bottle Company, Toledo, Ohio.

mold, the plunger tip and the bottom plate. The blank or measuring mold measures the exact amount of glass to be used in the bottle. The blow or finishing mold gives the bottle its final shape. The neck mold shapes the neck of the bottle. The plunger tip, through which the air is admitted to blow the bottle, also gives the correct cork size. The bottom plate, of course, forms the bottom of the bottle when it is blown in the blow mold.

As the machine rotates and each unit comes in turn to the revolving tank, the blank mold lowers itself to the surface of the molten glass and a vacuum sucks up enough molten glass to exactly fill the measuring mold. The molten glass flows around the plunger tip and the neck mold, forming the finished neck of the bottle. A knife cuts off the glass at the opening in the bottom of the blank mold through which the glass has been drawn into the mold, and retains its position at the opening until the glass has chilled sufficiently to retain its shape.

All this takes place while the bottle made by this arm on the previous revolution is cooling in the blow mold and is being discharged from the machine.



MICHAEL J. OWENS, INVENTOR

Returning to the blank mold, we find it has opened, the cylinder of white hot glass being held firmly at its top by the plunger tip and the neck mold.

The blow mold then moves into the previous position of the blank mold and closes on the white hot cylinder of glass. Air is then automatically admitted through the plunger tip and the body of the bottle is blown. The neck mold and plunger tip now release the neck of the bottle. The bottle, which is still held in the blow mold, follows a depressed track, passing below the revolving tank of molten glass at the same time that the blank mold of the same unit is measuring glass for another bottle. The blow mold now opens and the finished bottle is discharged, ready for the tempering ovens.

The Owens Automatic travels one and a quarter revolutions from the time the glass is sucked into the blank mold until the finished bottle is discharged from the blow mold. On small ware, with standard molds, it has produced ninety bottles per minute. But even when making pint bottles, it has produced more than fifty bottles per minute.

The blank mold, or the measuring mold as it is often called, with the vacuum method of sucking the glass into the mold, is one of the distinctive features of the machine. Exactly the same amount of glass is measured into each blank mold.

The Owens machine lives up to its name, the "Automatic." From the time the materials enter the furnace until the bottle is taken from the lehr, human hands play no part in the proccess. For each machine only one operator is necessary; he merely cares for the adjustment of the mechanical parts.

The basic principle is founded on the piston pump. With the intake the molten glass is drawn by suction into a mold. This mass of glass is then taken into a second mold and the piston pushed forward, forcing air into the glass and forming the bottle.

From this crude device has developed the machine considered by many as the most marvelous in the world.

In zinc oxide for glass making small quantities of lead, arsenic and antimony may be present as impurities, but the presence of iron or copper will cause color.

Gas Cleaning

With Cottrell Electrical Precipitation Process

By Roy U. Wood*

In the use of producer gas the problem of thoroughly cleaning the gas of soot, tar, ash, coke dust, or other suspended matter has been brought up many times for discussion. All these materials tend to clog up the gas lines and burners and add materials that are frequently deleterious to the product manufactured. Electrical precipitation has been used successfully as one of the solutions of this problem, and naturally so, for its superiority over other types of gas cleaning apparatus used in industrial operations of many sorts has been well demonstrated. A wider and wider field of application is being developed for this apparatus.

Theory of Processes

When a gas is passed through an intense electric field, suspended matter may be agglomerated and "precipitated" from the gas stream. The intense electrical field is obtained by a combination of "electrodes"—one being "filamentary" and the other having an extended surface. The former electrode has a high voltage impressed upon it and the latter is grounded. The electric stress at high potential in the filamentary or "discharge electrode" produces a "corona" which causes intense ionization of the gases, and a resultant intense electric field.

In the simplest form one electrode, the pipe (see Fig. 1), the other electrode a wire, suspended in the axial center of the pipe and insulated from the pipe, are connected up to a source of direct current at high potential. By proper electrical connections the wire is made the discharge electrode and the pipe the collection electrode. The direct current at high potential is obtained by "stepping up" an alternating current by means of a transformer to a high potential and then rectifying with a synchronously rotated switch to a pulsating or intermittent direct current.

With the unit apparatus the gas to be cleaned is passed up through the pipe, and by the electrical action the soot, cinders, tar and other solid or liquid materials are deposited on the sides of the pipe. The gas passes through cleaned and unaffected. Commercial installations are simply the building up of units consisting of one or more pipes in parallel (see Fig. 2 where there are twenty-one pipes in a unit.)

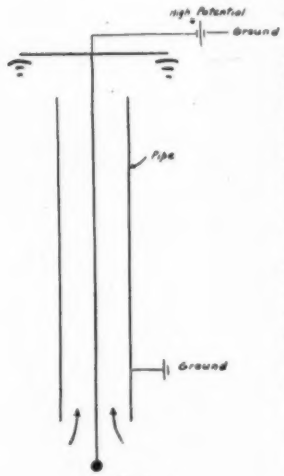


FIG. 1

Where the material is in the liquid phase (*viz.*, liquid tar and oils), practically as fast as it is precipitated on the pipes it drains down and drips off into the lower header. It may be disposed of by any desired means. On the other hand, if the material precipitated is in the solid phase (*viz.*, cinders, coke, etc.), periodically the electrodes must be cleaned by cutting off the flow of gas and power and rapping the electrodes. The material will fall to the bottom header, where it may be disposed of. If a combination of the liquid and solid phases are present to the point that the material will not flow down the pipes, nor rap off readily, a means has been devised of mechanically scraping the pipes with little or no interruption of operations. The length of time between the cleaning periods in the latter two cases will naturally depend upon the amount of material to be removed from the gas. To give most satisfactory operation for the latter two conditions, two units should be used so that one will be in operation during cleaning periods.

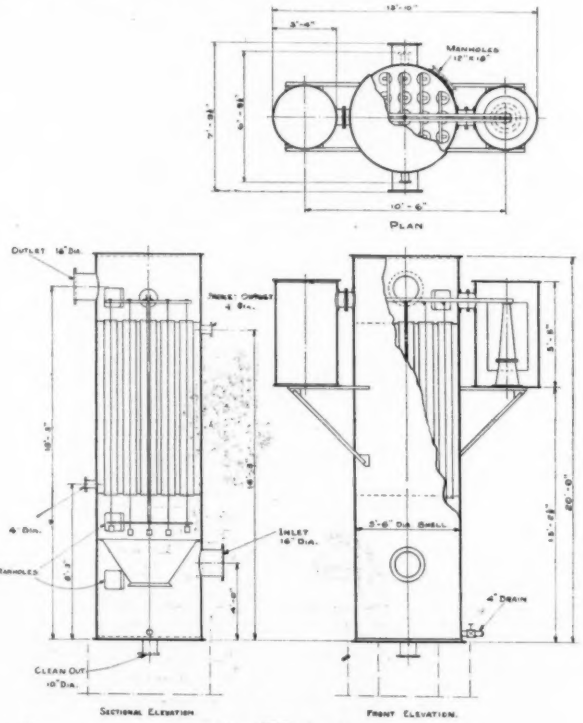


FIG. 2

Producer Gas Cleaning

The cleaning of producer gas falls into one of the following classes:

(1) Hot gas cleaning to remove soot, cinders, etc.

(2) Cold gas cleaning to remove tar, oils, etc., together.

(3) Hot gas cleaning as in (1), followed by cold gas cleaning as in (2), for removal of tars, oils, etc., which may be subsequently used for some other purpose.

No attempt will be made to go into the merits of the use of hot, clean gas, carrying a large quantity of water vapor and some tar, as contrasted with cold, clean gas, carrying very much less water vapor and no tar, due to cooling and subsequent precipitation. Both methods have their supporters, and the Cottrell apparatus can be used with either.

Cold Gas Cleaning

An installation has been in operation for some years (see Fig. 3) on cold producer gas. The gas from five Morgan producers is passed through primary scrubbers, Ernst washer and baffle dryer. When the gas leaves these cleaning devices it contains 0.2 to 0.3 grain of tar per cubic foot. The Cottrell Precipitator cleans the tar from the gas at this point down to much less than 0.01 (average 0.005 grains) grain per cubic foot at 60° F., 30" Hg. The gas is then used in internal combustion engines, where the presence of tar would have a very detrimental effect. The operating cost of this plant, including a liberal figure for fixed charges, is approxi-

*Research Corporation.

mately $1.45 per million cubic feet of gas cleaned when the daily production is between five and six million cubic feet per twenty-four hours.

Considerable development work has been done on a range of standardized precipitators for small, special type gas producers to eliminate the tar and to do away with the nuisance of shutting down part of plant to remove clogged filters. Removal of the tar of better than 99 per cent has been obtained. The installation cost of these units will vary from $50.00 to $200.00 per thousand cubic feet per hour capacity with a liquid tar being precipitated. The same size units with the automatic scraping device, where a sticky pitch is encountered, will be slightly higher in cost. The power consumption of these units will be from less than three kilowatts for the larger units down to less than one kilowatt for the smallest.

An interesting set of filters from tests with a tar camera of the use of the Cottrell Precipitator is shown in Fig. 4. They were taken on gas from by-product coke ovens. Filter A shows tar and oil content of one cubic foot of gas leaving primary condensers collected on filter.

Filters B and C show tar content in two cubic feet of gas after passing through wash boxes and benzol scrubbers collected on filter.

Filters E, F, G and H show tar content in two cubic feet of gas after they have been cleaned by the Cottrell Precipitator with different velocities of the gas through the pipes. Filter H being the one for the operating speed of the gas in commercial installations.

Filter D is a blank for comparison.

Hot Gas Cleaning

Hot gas cleaning can be accomplished just as readily and has been done under some of the most rigid conditions. Sulphur dioxide gases for chamber sulphuric acid manufacture have been cleaned successfully up to 1,200° F. to eliminate cinders, etc. Also, iron blast furnace gas up to 1,200° F. (ferromanganese operations) has been treated to remove cinders, ore, etc., previous to its being used under boilers and in hot stoves. Both these operations reduce shutdowns of plants for cleaning flues, chambers, stoves, and boiler settings to a minimum.

While no installations have been made on hot producer gas cleaning, the conditions of operation will be much less severe than the cases cited above. Reference to the bibliography on the Cottrell apparatus will furnish descriptions of these installations.

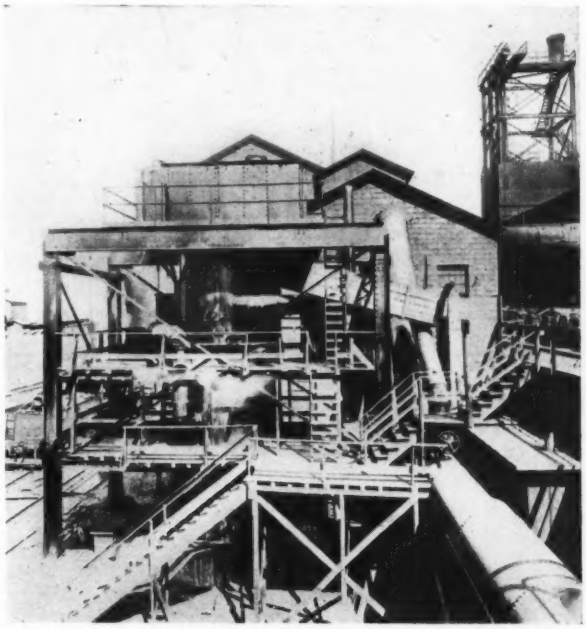


FIG. 3

The Cottrell apparatus is constructed, installed and placed in commercial operations, with guaranteed efficiency of removal of the solid or liquid materials suspended in the gas. Some of the salient features of the apparatus are listed as follows: 1. Low power consumption. 2. Uniform very low back pressure on apparatus. 3. Practically no labor. 4. Low repair costs. 5. High efficiency of cleaning. 6. Continuous operation. 7. More uniform and better product obtained.

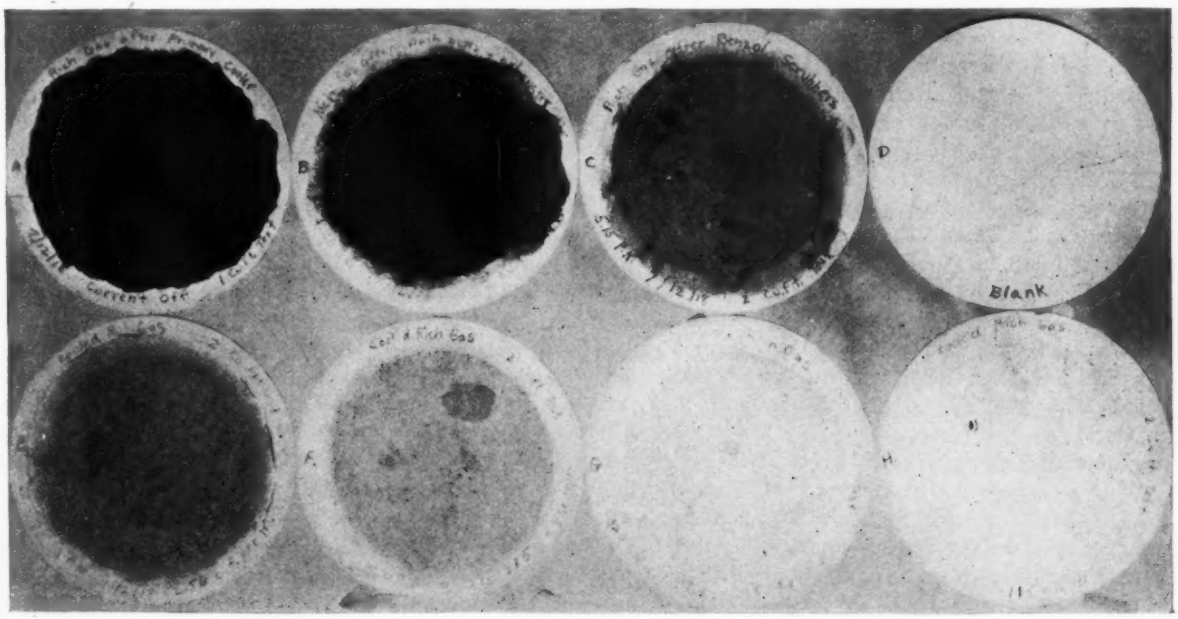


FIG. 4

A Rapid Method of Testing the Durability of Glassware

[At the March meeting of the Society of Glass Technology, England, a paper by H. S. Blackmore, Miss Violet Dimbleby, and Prof. W. E. S. Turner, describing a rapid method for testing glassware, was presented by Miss Dimbleby and reported as below in a recent issue of the *Pottery Gazette and Glass Trade Review*.]

Miss Dimbleby herself communicated a broad outline of the paper to the meeting, and was thus the first lady to occupy the Society's platform. She was cordially received, and was given a most attentive hearing. She commenced by saying that some time ago one of the joint authors was asked to express an opinion on the value of Schweitzer's test for ascertaining the durability of ampoules by their effect on a dilute solution of the alkaloid narcotine hydrochloride. Tests with similar reagents had previously been described, *viz.*, those using solutions of morphine hydrochloride and strychnine nitrate, as well as mercuric chloride and phenolphthalein, and one of the authors had previously directed attention to their value, especially in testing medicine bottles, which might have to form receptacles for such solutions. The use of narcotine hydrochloride was, however, not familiar; but, as a result of some preliminary experiments, they became impressed with its value, and decided to make a thorough investigation. In consequence, they were able to report that the re-agent furnished a very valuable test, quickly applied and certain in its results, provided reasonable care was taken. Moreover, the apparatus required was inexpensive, the procedure was simple, and the actual scientific knowledge required by the operator so slight that the test could be carried out in any factory.

Describing the test, Miss Dimbleby said that the narcotine hydrochloride was used in exceedingly dilute solution, *viz.*, one part by weight in 1,000 parts of pure distilled water. The solution itself must be made in a very resistant chemical glass. A certain glass had been found to be very resistant to its attack, and this did not show any sign of corrosion, even after continued use. The receptacle containing the solution was placed in a water bath, heated up to the temperature of boiling water, and kept at that temperature for some time. The vessels to be tested were first washed out with distilled water; then with a very dilute mixture of acetic acid and water; then with water; and finally with alcohol. They were subsequently dried in an air oven, and were afterwards brought up to 100° C. in a water bath, the same temperature as the narcotine hydrochloride with which they were to be tested. The re-agent was then poured into the vessel about to be tested, and a definite volume was used, depending upon the size and surface area of the vessel being tested. The heating was continued, so that the vessel was really being sterilized with the solution inside it. The solution was quite clear to begin with, and its appearance was noted at intervals of 10, 20, 30, and 45 minutes, as well as at the end of an hour. The test could be even further prolonged if it were necessary. If a cloudy deposit appeared in the solution in the vessel within 10 minutes, the test stated that the glass should be rejected, for it was a poor glass. If, on the other hand, a very slight deposit or cloudiness appeared in the solution within 15 to 20 minutes, and this did not increase as the time extended during the hour, then the glass was better, although it was still not quite good enough to be used for medicines in which alkaloids were used. Again, if a deposit that was only slight appeared within 20 minutes—and in this case the deposit would appear as minute needle-shaped crystals—and did not increase throughout the hour, the glass was deemed to be good. This was how the test was stated, and it was the purpose of the authors of the present paper to investigate the claims made.

The test was submitted to a very stringent examination, using glass tubes of known composition, chemical glassware, and, lastly, a variety of bottles which had come into the Department of Glass Technology at Sheffield University from time to time, the behavior of which had been studied from the aspect of their physical and chemical properties, as well as their durability. From the results, it would appear that the test was quite reliable, and was successful in picking out within a very short time those glasses which could safely be used as containers of alkaloid solutions. As before stated, it was a simple test which could be applied by almost anyone in any factory, because no special apparatus or special knowledge of chemistry was required, and, seeing that it was also rapid and safe, it was recommended as suitable for employment in any ordinary glassworks. Since the adoption of this test would be likely to prevent the deterioration of glassware upon storage, or complaints arising from unsatisfactoriness in use, glass manufacturers would be well advised seriously to consider it.

Prof. Turner said that he thought they had now got to a rather closer understanding of the label of caution which often appeared on medicine bottles, "To be shaken before taken," for it had been demonstrated that, owing to the alkali that was extracted from the glass, some of the drugs in solution were sometimes precipitated, and the medical man had to allow for the bottle and the solids in suspension. They would all be anxious to congratulate Miss Dimbleby upon being the first lady to address the society, and he hoped that she would again appear, and that other ladies, too, would come forward from time to time, especially if they all handled their subjects with the clearness and conciseness that the speaker had evinced that afternoon. Speaking for himself, he would rather like the tests on the samples of chemical glassware to be repeated before they were accepted as conclusive, because, to him, it was a trifle surprising to find that after 20 minutes a precipitate, although slight, should appear. He was inclined to think that a repetition of the test might possibly indicate that no cloudiness would appear at all. He would also like to emphasize that, not only was the test a good qualitative one, but it should enable them to draw the line in a series of glasses between bad, poor, and good, and particularly so in the case of the soda-lime glasses of differing compositions. Three years ago he emphasized the need for keeping up the lime content to 8 per cent or more, if possible, and the alkaline oxide content down to certainly not more than 16 or 18, and the line that was drawn on that occasion was marked quite definitely by the reagent they had been considering that afternoon, *viz.*, narco-

tine hydrochloride. He thought the adoption of such a test would obviate such lengthy and elaborate papers as they had seen appearing in their American contemporary, advising all sorts of methods by which to treat glass containers in order that they might withstand the action of the contents for a considerable time. The only cure was to make a better glass, and the manufacture of the glass could be readily gauged by this particular test.

Mr. J. G. Hill inquired whether the test in question had been applied to ordinary beer glasses, which, of course, were made from lead, as well as to the particular glasses to which reference had been made in the paper.

Mr. F. G. Clarke said that he thought the paper should be extremely valuable to manufacturers, if they would only take notice of it. He was wondering whether the test could be made into a quantitative, as well as a qualitative, one. Would it not be possible for the cloudy deposits to be weighed or measured in some way? And with regard to the narcotine hydrochloride, would it be possible to keep it in lead bottles instead of having to provide those necessarily expensive silica bottles which had been referred to; if not, could gutta-percha bottles, or something of that sort, be used?

Miss Dimbleby, in reply to Mr. Hill's question, said that no definite tests had been carried out upon lead glasses as yet. The reason was that they did not happen to have any lead glasses about them at the time in the laboratory. But she did not see why such tests should not be made, and reported upon later. With regard to Mr. Clarke's question, she was not at all sure whether any measurements of the deposits could be carried out that would be sufficiently reliable and warrant the time and trouble that they would involve. She was afraid that they would have to do far more work on the subject than had already been done, and that a much wider range of glasses would have to be taken before a quantitative test could be accepted as being conclusive. It might be possible, but it had yet to be proved. As to the storage of the solution, she did not think this should involve any real difficulties. Although it rapidly attacked nickel and other metals and gave a quick deposit, it did not attack platinum. That, however, was too expensive. Lead had not yet been tried. Personally, she would not recommend storing the re-agent as a solution, but making it up specially whenever it was intended for use. She thought that any good resistant glass could be used as a container for the solution for the comparatively short time that it was necessary to hold it in the carrying through of a test. She did not see why an ordinary high-lime glass should not be suitable for the purpose.

Prof. Turner added that, although the discussion had centered, to some extent, around containers, he saw no reason why window glass or any other type of glass should not be tested inside another glass which was known to be sufficiently resistant. One would find that practically all the really good chemical glasses on the market were good enough for the purpose of a container, and if a manufacturer had not available a chemical glass, and did not wish to buy it specially, if he made a good amber glass he would probably find that to be good enough for the purpose.

Variation of Bottle Capacities*

The amount of variation which occurs in the volume of bottled foods packed under conditions of "good commercial practice" is often the subject of controversy among the bottler, the food official, and the bottle manufacturer. The Bureau of Chemistry made a number of investigations on this subject. Some of these investigations have been somewhat disconnected, but the gaps existing in the information thus obtained have been filled in, so far as possible, by supplementary investigations. The prevalence of various methods of packing bottled foods, prevalence of the various types of bottles used for foods, prevalence of the different types of bottles manufactured, types of filling machines, methods of manufacture, commercial methods of purchasing and testing bottles, variations in capacity of bottles, variations in volume of contents of bottles of food, and allied subjects have been studied to determine the difficulties involved in packing bottled foods with a uniform quantity of contents.

The variation of the quantity of food in the bottle depends on many factors, since various types of bottles are manufactured by various methods and filled by various methods. The causes of the variations are cumulative, extending far back into the history of the bottle.

*Abstracted from Bulletin No. 1009, Volume Variation of Bottled Foods, U. S. Department of Agriculture, H. Runkel, Assistant Chemist, and J. C. Munch, Junior Chemist, Bureau of Chemistry.

Bottle Manufacture

Bottles are manufactured by three processes: Hand, semi-automatic machine, and automatic machine. The processes vary in two particulars—first, the method of gathering the proper amount of glass to be blown into a bottle, and, second, the method of blowing the bottle.

In all processes the mold is manufactured according to strict specifications and tests. Its cavity, which controls the exterior dimensions of the bottle, is accurately machined to previously determined dimensions, and sample bottles are blown for weight and capacity tests before it is installed. With continual use a scum accumulates in the mold, slightly diminishing its interior dimensions. After this scum has been removed a sufficient number of times, the mold's dimensions become appreciably larger, so that a new mold must be substituted for it.

To assist him in keeping the weight of the bottles as accurate as possible, the hand blower familiarizes himself with the weights of the bottles as he blows them and can at once adjust any tendencies toward overweight or underweight. In the Wage Scale and Working Rules of the Glass Bottle Blowers' Association the blower is continually cautioned to "work as close to weight given as possible." Similar precautions are taken in blowing bottles by the machine process. For the past 30 years at least the National Glass Bottle and

Vial Manufacturers' Association, composed of manufacturers, and the Glass Bottle Blowers' Association, composed of blowers, have held annual conventions, where questions pertaining to their several interests are discussed and agreements made by which each party should be governed. The limit of variation in weights which would be permitted during the ensuing year has been one of the questions decided at these meetings. This point became of special importance after the passage of the Net Weight Amendment to the Federal Food and Drugs Act, March 3, 1913, when the food officials were also consulted. The variations agreed upon and adopted in 1914 have been readopted annually without change. The manufacturer has the privilege of rejecting bottles whose weights fall outside these allowable variations.

To show the extent to which any allowable variation will be applicable to all bottles, it is necessary to note that the variation in the weight of hand-blown bottles is greater than that of machine-blown bottles. While this is generally an accepted fact, it has been further verified by 27 sets of data collected in the course of these investigations, each containing measurements on 25 to 50 bottles of 4, 8, and 12 ounce weights. It was found that the respective average deviations were 0.12, 0.24, and 0.37 ounce in hand-blown ware, and 0.03, 0.06, and 0.18 ounce in machine-blown ware.

Bottle Filling

The accuracy in bottle filling is affected by every operation of the bottler from the time he places his order for bottles until they are sealed and labeled. In placing the order the bottler has in mind, and sometimes states in his contract, the capacity which he desires. Upon receipt of the bottles the correctness of their capacity is ascertained by actual measurement, or else it is assumed that the manufacturer has delivered bottles having the capacity designated in the contract. According to the tests made the bottles are rejected or suitable arrangements are made for their use by changing the declaration of contents on the label. In a survey it was found that 10 of 16 bottling factories made tests on every lot of bottles received from the factories, and also that 10 of these bottlers did not specify in their contracts with the glass factories the capacities which they desired for their bottles.

The liquid food is filled into the bottle by machines of various degrees of complexity. A general study of the catalogues of bottle-filler manufacturers has shown these fillers to fall into three general types. The first is practically a hand filler. The second type of filler works upon the siphon principle. The third type is a development of the second type in which the liquid runs into a measuring chamber of adjustable dimensions before delivery to the bottle. A uniform volume is thereby delivered into each bottle.

Of these types of fillers the second is most common. The third is used more generally for filling cans which are not transparent. Regardless of the type of machine used, the bottler is impelled to fill his bottles to a definite height in order that they may make a satisfactory appearance as a commercial article. It was found during the inspection of a number of factories that even where machines which measured the quantity to be delivered were used, continual attention was given to the height of fill of the bottle. The short capacity bottles, which were always too full and filled high in the neck, were partially emptied into the over-capacity bottles, which were not full enough, in order to obtain a more uniform quantity of contents.

Although foods are put up in a large variety of bottles, three surveys of the industry indicate that certain types are very prevalent. In view of the mooted questions concerning the panel bottle it has not been included in this study.

Variations in the weight of bottles which the manufacturer shall allow to the blower, as published in the Wage Scale and Working Rules of the Glass Bottle Blowers' Association, are given in Table I.

Table I.—Variations in Weight of Bottles Allowed by Manufacturers

Weight of Bottles Ounces	Under Ounces	Over Ounces
½ and under	⅛	⅛
½ to 1	⅛	¼
[1]1 to 2	¼	¼
2 to 4	¼	½
4 to 6	⅜	⅝
6 to 8	½	¾
8 to 10	½	¾
10 to 12	¾	¾
12 to 14	1	1
14 to 17	1	1
17 to 20	1	1½
20 to 25	1¼	1½
25 to 28	1½	1½
28 to 32	1½	2
32 to 40	2	3
40 to 50	3	4
50 to 60	4	5

[1]Inclusive. The following figures are not inclusive.

The variations as given in Table I are applicable to bottles of particular weights. While bottles of any capacity may be blown at any specified weight, if so ordered, the general practice is to follow the weights and capacities stated in the Wage Scale and Working Rules of the Glass Bottle Blowers' Association. Weights of bottles of various capacities as stated in the Wage Scale and Working Rules have been compiled in Table II.

The simple types of bottles listed in Table II are very common food containers. They are the types to which the results found in this bulletin are applicable. The weights of bottles of any given capacity are so uniform that they fall within one of the definite ranges in weight mentioned in Table I. Each range in weight corresponds to a capacity. For example, a corresponding range in Table I of 1 to 2 ounces, avoirdupois, corresponds to a capacity in fluid ounces of 1. Therefore, there is an allowed variation in weight which corresponds to each capacity; that is, the first column of Table I has been converted from terms of weight to terms of capacity.

An increase in the weight of the bottle is caused by the use of more glass, which thickens the walls and decreases the capacity. Since the bottler is penalized for short capacity, the overweight limits as given in Table I were selected as the basis of computing the maximum variations in capacity. The overweight limits have been computed to volume equiv-

alents by use of the factor, 1 ounce of glass is equivalent to 3.1 drams in volume, the usual factor used by glass blowers and manufacturers.[1] This factor has been further verified by measurements and computations based on the specific gravity of glass given in literature, and is found to be sufficiently accurate for use in this bulletin. The volumes equivalent to the variations in overweight as given in Table I are computed by this factor and tabulated in Table IX under the heading "Individual bottles," opposite the various capacities given in Table II.

In the calculations of the maximum variations in Table IX the assumption has been made that the bottler is able to limit his variations in filling to any desired degree. The figures chosen for the calculations are the weight variations allowed to hand blowers. Machine-blown bottles are more uniform in weight and also in capacity. Since the majority of the bottles are blown by machine, this calculated maximum variation is representative of the variations in the volume of bottle foods when they are packed under the specific good commercial practice conditions outlined, which require that the bottler give special attention to his methods of filling.

TABLE II.—WEIGHTS OF BOTTLES OF VARIOUS CAPACITIES[2]

Types of Bottles	Capacity (Fluid Ounces)— ½ Oz.[3]	1 Oz.[3]	2 Oz.[3]	4 Oz.[3]	6 Oz.[3]	8 Oz.[3]	12 Oz.[3]	16 Oz.[3]	24 Oz.[3]	32 Oz.[3]	64 Oz.[3]
Round and fluted prescriptions	1.25	1.50	2.0	3.5	5.0	6.5	9.0	11.0	15	18	...
Round castor oils, lemon sirups, olive oils, etc.	1.00	1.50	2.25 2.5	4.0	5.0	6.5	9.5	11.0	16	20	...
Ovals, French squares, tall blakes, and oblongs	.75	1.25	2.0	4.0	5.5	7.0	10.0	12.0	18	20	...
Flats, short blakes, and oblongs	1.00	1.50	2.5	4.5	6.0	8.0	11.0	14.0	18	22	...
Grape juices and catsups, champagnes, octagons, rounds, squares	...	1.50	2.25	4.0	5.5	6.5	10.0	13.0	19	22	34
Tinctures, round and square	.75	1.25	2.0	4.0	5.0	6.5	9.0	11.5	15	18	32
Range in weight	.75–1.25	1.25–1.50	2.0–2.5	3.5–4.5	5.0–6.0	6.5–8.0	9.0–11.0	11.0–14.0	15–19	18–22	32–34
Corresponding range in Table I	½–2	1–2	2–4	4–6	4–6	6–8	8–12	12–14	14–17	17–25	32–40

[2]Avoirdupois. [3]Compiled from text of Wage Scale and Working Rules of the Glass Bottle Blowers' Association, 1918-19.

VARIATION IN CAPACITY OF BOTTLES

In order to determine the variations due exclusively to difference in the capacity of bottles, 22 representative glass factories located in Virginia, Maryland, Pennsylvania, New Jersey, West Virginia, and Ohio were visited, and 28 sets of measurements, including 1,090 bottles blown by hand and by machine processes, were taken. Certain conditions of blowing were prescribed before a set of bottles was selected for measurement. The molds were noted to be in good repair and to have been in use at least one hour before the bottles selected for measurement were blown. It was stated that the glass was in good workable condition. All machines were operating under favorable circumstances and all blowers and gatherers were journeymen workmen. In the case of hand-blown bottles, measurements were made on a set which had been blown in a single mold. In the case of machin-blown bottles, a run of machine ware was measured. All measurements were made by pouring water from a standardized graduate into the bottles.

[1]Bureau of Chemistry Hearing of Glass Bottle Blowers' Association, May, 1913.

PRACTICAL APPLICATION OF RESULTS

The bottler will be able to apply the results of this investigation as outlined in Table IX to guide him in making tests on bottles received. If the capacities of the bottles at his usual filling point vary from the capacity ordered by amounts greater than the results given in Table IX, he will necessarily feel that some further steps should be taken to meet properly the requirements of the law that the volume of food declared on the labels be correct. The bottle manufacturer will be able to use the results in Table IX to guide him in determining whether or not any shortage found in the volume of bottled food may be due to unavoidable difficulties in the manufacturing or filling of the bottles, and to determine whether the responsibility lies with himself or the bottlers.

SUMMARY

The calculated maximum variations in the volume of bottled foods, as given in Table IX, have been computed from the weight variation allowed the blowers by the manufacturers, and by the use of the relation between the weight and volume of bottle glass.

TABLE IX.—CALCULATED MAXIMUM VARIATION IN VOLUME OF BOTTLED FOODS

Capacity of bottles Fl. oz.	Calculated maximum variation in volume: Individual bottles Fl. oz.	Average of representative samples Fl. oz.
½	0.10	0.014
1	.10	.014
2	.19	.027
4	.24	.034
6	.24	.034
8	.29	.041
12	.29	.041
16	.39	.056
24	.39	.056
32	.58	.083
64	1.16	.17
128	1.94	.28

Data on the capacity of bottles and volume of food in bottles indicate that only a small percentage of the bottles of food filled in accordance with good commercial practice, as outlined in this bulletin, should vary in quantity of contents by more than the calculated maximum variations.

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CLASSIFIED BUYERS' GUIDE, PAGE 16

"To Keep on Growing, Keep on Learning"

Using Coal Twice

Industry has reasons to feel indebted to Mr. Henry Ford for many valuable lessons in industrial management and in effective methods of plant operation. In connection with the purchase of 20,000 acres of undeveloped coal lands in Kentucky the automobile manufacturer stated that it is his intention to solve the country's coal problems by "using every piece of coal twice." If this is carried out he will have done, of course, nothing which has not already been accomplished many years ago in those countries less bountifully supplied with coal than our own. But he does, in his characteristic way, point out where the remedy lies for the fuel problems we have.

The method of utilizing the heating value of coal, first as gas and secondly as coke is as well understood in this country as it is in Europe, but owing to the abundance of fuel resources, amounting to an oversupply in some sections, it has not been applied to any such great extent. Europe discovered long ago that one can eat his cake and have it, since the coal tar products proved to be even more valuable than the coal from which they were derived.

The nation is awaiting the result of a study of the coal situation by a number of well known experts, who, it is confidently expected, will be able to suggest a remedy for our present-day troubles. It is very probable that both capital and labor engaged in the coal industry will come in for their share of criticism. On the authority of one of the world's greatest coal experts we have the statement that much of the difficulty is due to gross inefficiency and shocking waste which has been going on in this industry ever since coal mining began.

As a nation we lack the appreciation of our good fortune in the matter of fuel supply. We have reached a high degree of efficiency in many lines of manufacturing, but are just beginning to learn a few of the primary lessons about the proper use of coal and the utilization of coal products, which for years have been burned to get rid of them.

If Mr. Ford can awaken the country to a realization of the true value of coal, he will indeed be a benefactor to his generation.

The Scumming or Weathering of Glass

The conditions under which glass is stored have a pronounced effect upon the appearance of the glass. For some time the Bureau of Standards has been studying this problem, and recently several hundred bottles which have been in storage six months under different conditions of storage and packing, were examined.

The results show quite definitely the better condition of ware stored in a dry place with an even temperature as compared with outdoor conditions or a very humid room, the latter being much more productive of scummed bottles. Bottles packed in thin fibre board boxes were in better condition than those packed in open crates, while bottles wrapped tightly in paper were in worse condition than those not wrapped. Cork or paper stoppers did not assist greatly in reducing the amount of weathering, but rubber stoppers nearly eliminated it. Dust seemed to accelerate the trouble.

Technical Consultation Service

THE GLASS INDUSTRY invites its readers to refer to this department any problems with which they may be confronted pertaining to raw materials, glass technology, laboratory and factory practice. While making no pretensions to the possession of unbounded knowledge or infallibility THE GLASS INDUSTRY is ready to assist its readers to the best of its ability in solving their problems. Readers who can offer better suggestions are invited to submit them.

Questions should be submitted in writing and will be answered by mail as promptly as possible. The sources of all inquiries will be held in strict confidence.

Question 49. Liability to Devitrification.—As a subscriber to your valuable paper, I want to avail myself of the privilege of asking your opinion in regard to a batch we want to use in our continuous tank holding 215 tons of metal and having a melting capacity of 35 tons per 24 hours, although we will never use more than 30 tons per day. Is the batch given below in any way liable to devitrification or is that same batch containing one-half pound of fluorspar (which we want to retain for a certain purpose) liable to attack walls of a tank more than is necessary?

Sand	100
Soda	37
Lime granulated	26
Salt cake	½
China clay	1
Salt	½
Fluorspar	½

Answer.—The information given in your letter is not complete enough to give a definite answer. It should have been stated what kind of glass you desire to make and whether you use machinery or not. Furthermore, no indication is given of the purity of the raw materials used. Sand may contain varying amounts of moisture, alumina, etc., and the same applies to the limestone which may run from 95-99 per cent calcium carbonate.

Assuming that the raw materials are very pure the glass will have roughly about the following composition:

Silica (SiO_2)	73.30 per cent
Sodium oxide (Na_2O)	16.03 per cent
Calcium oxide (CaO)	10.67 per cent

The china clay will introduce a small amount of alumina in the glass which must be considered beneficial. It also raises the percentage of silica slightly. The small amount of fluorspar will do no harm and the same applies to the salt cake and salt. We do not believe that they will affect the batch one way or another.

From our experience with glass of this composition we desire to state that this glass is very near the limit in silica, for the average furnace, and is very apt to show devitrification occasionally. To be on the safe side we would advise to increase the amount of soda to 38½ and the limestone to 27. This advice is given assuming that the sand used is of the highest purity and practically dry, and that the limestone is pure. The soda ash, if bought from a reliable concern, is always at least 99 per cent pure. Should devitrification occur, the soda may be increased to 39 pounds. With more than 10 per cent calcium oxide you can safely manufacture a glass containing 17 per cent sodium oxide. Of course, every increase in soda and limestone lowers the silica. As a rule it is safer to make glass containing not over 71.5 per cent silica.

We should be pleased to have your report as to how the proposed batch works out.—J. B. K.

New Books

Sampling and Analysis of Coal, Coke and By-Products.—Methods of the Chemists of the United States Steel Corporation for the Sampling and Analysis of Coal, Coke and By-Products. Published by the Carnegie Steel Company, Bureau of Instruction, Pittsburgh, Pa.

A committee composed of chief chemists from the largest coal and coke laboratories of the various constituent companies of the United States Steel Corporation collaborated in the preparation of this volume. The methods of coal analysis are described in detail, including a description of the method to determine the melting point of coal and coke ash. The procedures do not differ materially from those proposed by the American Society for Testing Materials.

Of great interest are the methods of analysis of by-products, coal tar and benzol products.

Letters to the Editor

Too Much Booze—Too Little Production

From the *Daily Citizen*, Fredonia, Kansas

"Friday night at midnight, the fire at the Fredonia Window Glass factory was turned out, following a sudden decision to shut down the plant.

"Late this afternoon C. F. Lutes, president of the company, in an interview with a *Daily Citizen* reporter, stated that the reason for the shut-down was 'too much booze.' Mr. Lutes stated that for the past several weeks the number of men at work varied so greatly that adequate production from the plant was impossible. He said that of the forty-five shops employed in the factory at least one-half of the number could not be depended upon to work at all steadily.

"With a full overhead expense going on all the time and only one-half the normal production being turned out, the officials of the company have been forced to close down the factory rather than to operate under the discouraging labor conditions which are responsible for the lack of production."

To the Editor of THE GLASS INDUSTRY:

Yours of the 7th inst., asking for further information regarding the closing of our plant, received.

In reply to same will say that I do not know that I can add anything to the article in the *Daily Citizen*, as this covers the conditions as they were at the time of our closing down. But I would like to repeat the part of the article which reads that of the forty-five shops employed at our factory, at least one-half of the number could not be depended upon to work at all steadily.

We have been here at Fredonia in the glass business for nineteen years and I never, at any one time, saw more booze and more drinking among the workers and even outsiders, than has been in Fredonia this Spring. This is not saying anything against Fredonia, as I do not think it is any worse than other towns, but for a State that is supposed to be bone dry, there is entirely too much drinking and bootlegging done, and we are certainly in hopes there will be some remedy for it in the near future.

It seems the class of booze that the men get now-a-days is so poor that they are not able to get over the effect of it for several days after they try to sober up.

At this time we have not decided just what we will do in regard to the future; that is, whether we will equip our plants with machines or not, but we can't see anything to the glass business except from a machine standpoint, as a large per cent of the members of the Window Glass Workers' Association are certainly not very dependable and unless they wake up to the fact that they have got to change their tactics, I do not see how they can expect to exist as an organization very long. The head officials of the organization do not seem to be able to enforce any of their laws, especially the "Notice" law. The workmen are supposed to give a seven days' notice, but this "Notice" law seems to be a thing of the past, as I do not think that we have had a half a dozen men in the last year that would give notice when quitting. They just draw their pay on a Saturday and that is the last we see of them.

And then again, with the machine competition that we have, the hand workers do not seem to realize that they should do the very best they can to meet this competition.

The glass situation from a selling standpoint has not been moving very freely for the last two months, but there now seem to be some inquiries and we believe and look for a good demand from this time on until Fall. The production in the Southwest has not been very great this last period on account of men not working as they should, and also on account of the scarcity of workmen.

FREDONIA WINDOW GLASS COMPANY,
Fredonia, Kans., May 10, 1923. By C. F. LUTES, President.

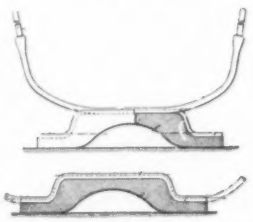
Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Copies of United States Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

Method of Making Solid Glass Rods having bends therein. U. S. 1,451,361. April 10, 1923. Victor Durand, Jr., of Vineland, N. J.

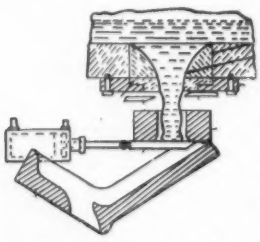
This invention relates to processes, by the practice of which solid glass rods having one or more bends therein may be made, and more particularly to those processes for making solid glass rods such as are used for supporting and guiding the filaments or strands of artificial silk in their travel through the tanks or baths in which such filaments are formed.



The process or method is claimed of making solid-glass rods with right angle bends therein which consists in drawing a mass of plastic glass into a stretch of plastic glass, circular in cross-section, and substantially uniform in diameter, laying said stretch while plastic into a groove substantially semi-circular in cross-section, the center line of the middle portion of said groove lying in one plane, the center line of the two ends of said groove lying in a second plane parallel to said first-mentioned plane and the center line of the entire groove also lying in a plane normal to said parallel planes.

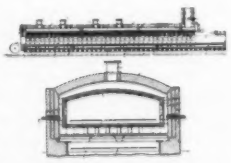
Process and Apparatus for Feeding Glass. U. S. 1,451,707. April 17, 1923. William J. Miller, of Swissvale, Pa.

The object of this invention is the proper presentation of the gather in the fabricating mechanism so that after it has been chilled and hardened by the shears or cup, the chilled end will not be presented to the mold where the hot end should be. This object is effected in this invention by reversing the gather after it is detached so that its hot end instead of its chilled end is presented below when it reaches the fabricating mechanism. Between the discharge orifice and the fabricating mechanism means are provided which are engaged by the detached gathers and which effect a reversal of the same.



Annealing Furnace or Lehr. U. S. 1,453,116. April 24, 1923. Walter O. Amsler, of Pittsburgh, Pa.

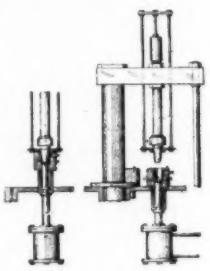
The present invention relates to annealing furnaces or lehrs of the continuous type, and particularly to glass lehrs in which a furnace of great length is employed, as distinguished from annealing furnaces having a short fire box or heating chamber.



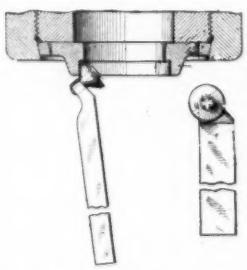
Among the objects of this invention are, to provide a furnace and a tunnel in communication therewith of great length, in combination with a plurality of overhead independent combustion chambers; means for passing products of combustion and heating gases into the tunnel structure for the purpose of heating the entrance of the tunnel and its forward end for a considerable distance; means for passing the products of combustion, etc., into the tunnel structure and returning them to the chimney; and new and improved means for effecting a desired temperature control throughout the length of the annealing chamber and the tunnel.

Matrix Device for Molds. U. S. 1,453,277. May 1, 1923. Peter Kucera, of Connellsville, Pa., assignor to Capstan Glass Co., of Connellsville, Pa.

The invention provides a block mold with a movable portion carrying the design or configuration which it is desired to impress upon the side wall of the article being formed. This movable portion may be arranged in such manner as to be impressed on the interior or exterior of the side wall and preferably is so arranged as to be automatically withdrawn by the ordinary operations of the machines carrying the mold. This construction permits this type of mold to be utilized on the ordinary machines without change of machine, the only change being in the mold structure itself. One specific embodiment of the present invention comprises a block mold for tumblers, packers' ware, or the like, adapted to be carried by the ordinary glass press and wherein slidable matrix members are provided in the side wall of the mold in such manner that the movement of the parts during the pressing operations causes actuating means for the slides to become effective to withdraw the matrix from the side of the finished article when the pressing operation is completed.



Method of Manufacturing Ring Molds and the Like. U. S. 1,453,278. May 1, 1923. Peter Kucera, of South Connellsville, Pa. Assignor to Capstan Glass Company, of Connellsville, Pa.

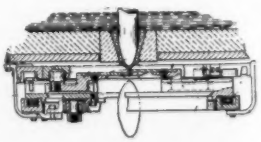


An object of this invention comprises the method of treating worn ring molds by applying pressure to the mold to reshape the matrix portion of the mold and to displace a side wall of the mold whereby sufficient metal is provided to permit reforming of the mold to the required size.

This displacement may be accomplished in different ways, but the preferred way is that of spinning. By the spinning method the ring is mounted in a suitable chuck and is subjected to a spinning roll moved under pressure in the direction of the axis of the ring, so that the desired displacement of the metal is accomplished. After an excess of metal has been displaced, the required diameter may be obtained by spinning the metal back to the exact diameter desired, or a very slight cut may be made with a suitable lathe tool or otherwise (for example by means of a reamer), and the ring is again ready for use. The invention also contemplates the manufacture of ring molds by this method.

Glass-Cutting Mechanism. U. S. 1,453,315. May 1, 1923. Enoch T. Ferngren and Leonard D. Soubier, of Toledo, O., assignors to the Owens Bottle Company, of Toledo, O.

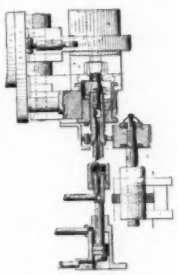
This invention is claimed to provide a practical form of cutting apparatus which will sever gobs of molten or plastic glass without deforming or displacing it. For this purpose there is provided a pair of cutter blades which approach the issuing stream or column of glass from opposite directions and which during their cutting movement are rotated in a horizontal plane, whereby the cutting edges move spirally



into the glass. The movement of the blades may be such that each blade is rotated through substantially 180 degrees while severing the glass, so that at the completion of the cut it is moving in the opposite direction from that in which it was moving at the commencement of the cut. This movement of the cutter blades prevents deformation and displacement of the glass and results in a smooth, symmetrical cut surface.

Machine for Making Bottles, Etc. U. S. 1,453,759. May 1, 1923. Warren E. Glaspey, of Bridgeton, N. J., assignor to Spring Stopper Company, of New York, N. Y.

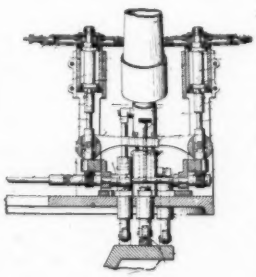
This invention relates particularly to the provision of means in connection with bottle making where bottles having internally threaded mouth portions may be produced.



The rotary mold carrier is equipped with revoluble mold-supports which serve to invert the molds and then right them as the molds are carried in their orbit. A gear-equipped threaded mandrel is carried with each mandrel; a pair of continuously rotating, oppositely revolving frictionally-mounted gears are employed at different stations, one of these gears being engaged by the gear elements of the mandrels, seriatim, to elevate the mandrels preparatory to the glass-charging operation and the other of said gears being engaged by the gear elements of the mandrels, in turn, and serving to lower the mandrels, in turn, at the bubble-blowing station; and at the glass-charging station which is intermediate between the mandrel-elevating station and the bubble-blowing station, a blow-head is employed to force the glass down into the lower portion of the mold, so that it will form properly about the tip of the mandrel in the neck portion of the mold. In the illustration given an auxiliary gear element in the form of a shiftably mounted gear segment is employed to start the unscrewing movement of the mandrels when the glass in the mold is cooled sufficiently to render this desirable.

Glassworking Apparatus. U. S. 1,453,803. May 1, 1923. John A. Milliken, of Bayonne, N. J., assignor to John E. Marsden, of Egg Harbor, N. J.

This invention relates to an apparatus for performing operations upon glass or glassware, especially for cutting or ornamenting glassware, such as drinking glasses, tumblers and the like.



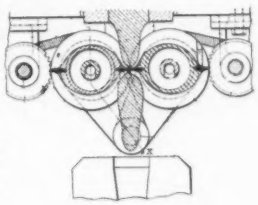
A table, carrying numerous groups of cutter mechanism disposed circumferentially thereon is rotated by means of a motor. The cutters of each unit are rotated at desired speeds, cutting into the article from opposite sides thereof and making cuts therein at different angles, due to the inclination of the axis of the article.

The cutters rotate and cut into the glass, their supports being pulled toward each other by a spring. The depth of the cut is limited by stops provided for that purpose. When the desired depth is reached the supporting structures of the cutter are acted upon by levers and moved away from the article.

While the cutters are out of engagement with the article, the article is rotated through a suitable angle and thereafter the cutters again move towards each other and re-engage the article. This operation continues, the cutter wheels periodically engaging and departing from the article, which article is stepped around until the design is cut completely around the circumference of the article. When the cutting is completed the holder or chuck releases the article, which is then removed by the operator.

Method of and Means for Feeding Molten Glass. U. S. 1,453,290. May 1, 1923. Leonard D. Soubier, of Toledo, O., assignor to the Owens Bottle Company, of Toledo, O.

It is at present customary in the art to flow molten glass in the form of a stream from an outlet opening in a refining tank or other container and periodically sever the flowing glass to form individual masses or gobs which are introduced into the molds.

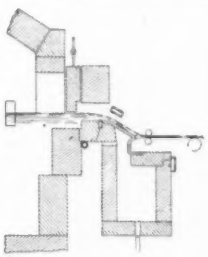


An object of the present invention is to provide suitable forming means to engage the descending column or stream of glass and shape it into gobs of suitable conformation and then sever them from the oncoming glass, such operation taking place without interrupting the continuous and substantially uniform flow of the glass.

In its preferred form, the invention comprises a pair of gob forming rolls having their peripheries running in contact and shaped to provide a passageway between the contacting peripheral edges of the rolls. The rolls are arranged to embrace the descending column of glass which is formed in said passageway into suitably shaped gobs, the latter being automatically severed by cutters carried on the rolls.

Apparatus for Drawing Sheet Glass. U. S. 1,453,842. May 1, 1923. William J. Jacobs of Toledo, O., assignor, by Mesne Assignments, to the Libbey-Owens Sheet Glass Company.

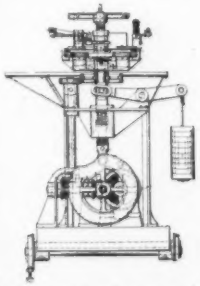
This invention relates to an apparatus for drawing sheet glass, and more particularly to the apparatus for treating the glass preparatory to drawing it into a flat sheet of predetermined thickness. The operation of the device is as follows: The glass having melted in the tank and the gate being raised, the glass will flow out over the tile in a shallow sheet, down the slab. This sheet is started by the use of the usual bait, and after it is started and the width obtained so that the edge rolls grasp the edges of the sheet, the drawing mechanism will continue to draw the sheet outward as long as the glass is supplied.



By the use of the inclined slab, the glass in the tank may be kept at a lower temperature, as gravity tends to help the flow. By having the slab of metal it may be thinner and the regulation of the temperature of the stream or sheet of glass upon it more readily effected.

Apparatus for Gathering and Transferring Molten Glass. U. S. 1,453,285. May 1, 1923. John F. Rule, of Toledo, O., assignor to the Owens Bottle Company, of Toledo, O.

This invention relates to apparatus for gathering charges or gobs of glass by suction into a transfer receptacle and transferring them to molds or other receptacles. An object of the invention is to provide suitable means for segregating the individual charges from the supply of molten glass, giving them suitable shape for entering the molds, maintaining the glass in a hot, plastic and homogeneous condition during such transfer and quickly transferring the glass while in such condition to the molds. A further feature of the invention consists in providing means for applying a reheating flame to the lower end of the gob of glass while in the transfer cup, thereby remelting the glass which has been chilled by the cutter and eliminating the shear mark. This reheating of the glass is also of special value in connection with inverted molds for forming bottles and the like, as it renders the end of the gob which first enters the mold sufficiently hot and plastic to readily take the form of the mold.



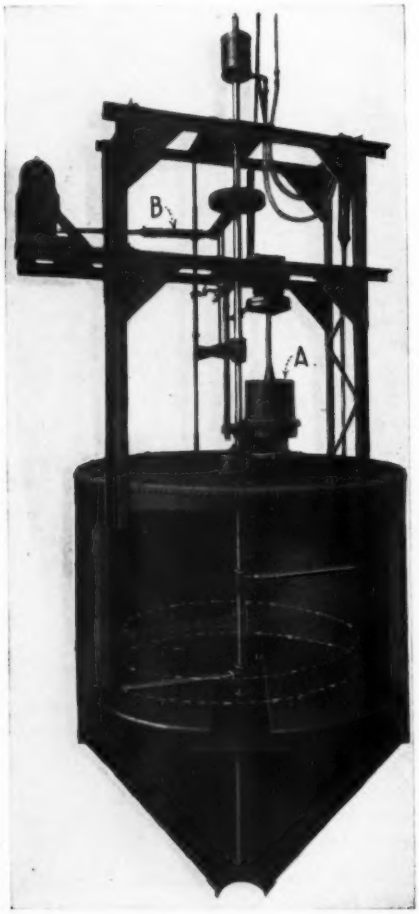
Glass Factory Equipment and Supplies

THE GLASS INDUSTRY will be glad to publish descriptions of new and useful devices, machinery and supplies of interest to the glass manufacturing trade. Most of the information printed in this department comes direct from the manufacturers of the products described.

The Galusha Mechanical Gas Producer

A gas producer designed along distinctly different lines from those embodied in the types in general use in glass factories has been developed by the Gas Producer & Engineering Corporation, 113 Broad street, New York, who state that their Galusha gas producers have been in successful commercial production for 18 years, meeting greatly varying conditions in over twenty different countries.

The outstanding feature of their latest design is the stationary body with automatic adjustable and easily controlled agitating device. With the object of accomplishing complete



GALUSHA MECHANICAL GAS PRODUCER

agitation of every cubic inch of the fuel bed and ash bed, a vertical shaft with either one or two horizontal rotating arms made of special seamless drawn tubing and water-cooled to their extreme ends through inner tubes, is employed. Simultaneously with the rotation of the arms they are automatically raised or lowered through the entire fuel bed, as indicated in the accompanying illustration, this complete horizontal agitation resulting, the builders state, in the prevention of clinkers, the elimination of blow holes, avoidance of the formation of vertical passages in the fuel through which dirt may be blown out with the gas into the flues or air may rise to the top burning the gas and lowering its quality; causing a high CO_2 content and a lower percentage of CO.

The fuel is supported on cast iron grates with a step grate in the center. The revolving horizontal arm in its passage downward grinds and pushes the ash into the hopper below from which it can be removed once every twenty-four hours by simply pulling the valve on the bottom of the cone. Removal of the ash from the cone does not disturb the fire or stop gas production.

The agitator is designed to keep the ash bed and fuel bed at a uniform depth and density, and to expose the fuel bed over its entire area to the action of the saturated air.

The coal, from an overhead bin, is fed automatically from the hopper A at a controlled rate and falls upon a cone-shaped baffle (not shown in the illustration) which is attached to the vertical driving shaft and rotates, rises and falls with it. The baffle deflects the coal to the outer edge, or to the center and intermediate positions, according to its distance above the surface of the fuel bed.

The coal hopper is provided with an automatic feeding device which at intervals drops a pre-determined quantity of coal into the producer, automatically closing tightly, in between times, the opening between the hopper and producer to prevent the escape of gas.

The driving mechanism is simple and easily accessible. Ample overload motor capacity is provided for driving the crank arm through a reduction gear. Provision is made against damage to or stoppage of the agitator should an arm strike an obstruction, by driving the crank through a spring which compresses when pressure increases. The only water used is for the cooling system and that requires very little and it can be used over and over again.

The builders of the Galusha mechanical producers state that this type with the automatic agitating device has been applied to open-hearth, annealing and similar furnaces, as well as in the glass industry. They believe there is a wide demand, especially among the smaller factories, for an efficient producer of lower cost than the standard types and that by simplifying their design and thereby reducing the cost of construction, and by building small sizes they can successfully meet that demand. At the present time they are prepared to furnish the producer in the following sizes: 6½ ft., 7 ft,. 7½ ft., 8½ ft., 10½ ft.

The W-R Carbon Dioxide Recorder

A simple and rugged type of apparatus for the continuous automatic estimation of carbon dioxide in flue gases of boiler plants is the W-R CO_2 Recorder, manufactured by the Chadburn Engineering Co., Troy, N. Y., and distributed by the Yarnall-Waring Co., Philadelphia, Pa.

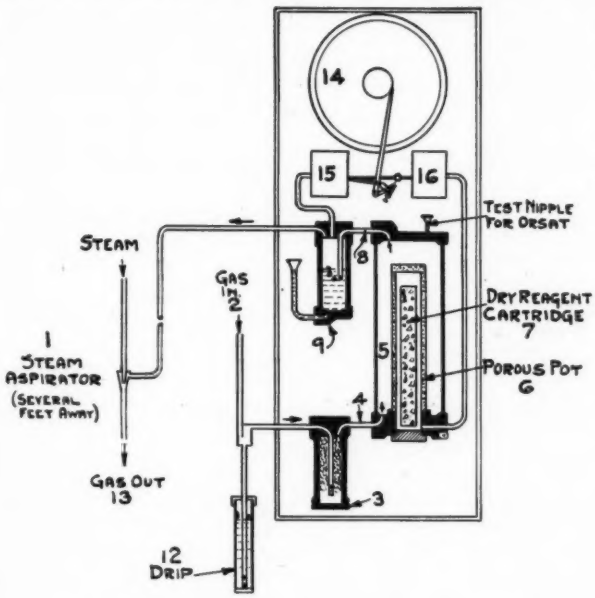
It is a well recognized fact that fuel is burned most efficiently when completely consumed with the least amount of excess air. Economical combustion of fuel under boilers can be attained and maintained by attention to the following rules:

1. Boiler heating surfaces should be kept clean. Soot is a non-conductor of heat, five times greater than asbestos; one-eighth of an inch will cause about 5 per cent fuel loss. Soot cleansers will help keep the flues clean. Scale an eighth of an inch thick will cause a 10 per cent heat loss and may become dangerous besides.

2. The boiler settings should be kept tight. Furnace efficiency is impossible with leaky boiler settings, brick is porous and leaks air. Plastic coatings will keep settings tight, resist heat up to 2,500 deg. F. or higher, remain plastic and will not peel or blister.

3. The draft should be regulated by watching the amount of carbon dioxide in the flue gases, which can be done by the use of a CO_2 recorder. High carbon dioxide means high temperature through the elimination of excess air. An insufficient

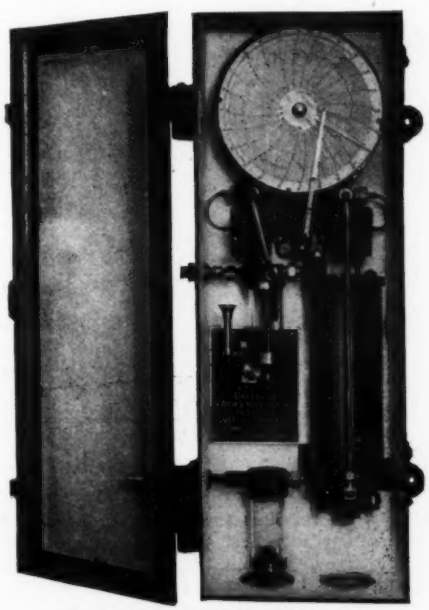
supply of air will produce carbon monoxide and the unconsumed gases escape through the smoke stack to the atmosphere, which is also a waste of fuel. It can be easily understood, therefore,



that unless the firemen are provided with proper instruments, it is impossible to maintain an economical combustion of fuel.

HOW THE W-R CO_2 RECORDER WORKS.

Flue gas taken from the last pass of the boiler passes through a heavy preliminary filter, not shown in Fig. 2, and is drawn continuously through the instrument by the steam jet aspirator 1. Gas enters at 2, passes through secondary filter 3 and through



W-R CARBON DIOXIDE RECORDER

tube 4 into chamber 5. Here a portion of the gas percolates through the porous pot 6 and thus comes in contact with the dry reagent cartridge 7, which absorbs all CO_2 contained in the gas. The sample passes up through tube 8 into glass flow indicator 9, where it bubbles up through the water and is drawn out through the gas outlet 13 by the steam aspirator 1.

Owing to the absorption of CO_2, by dry reagent cartridge 7, the pressure inside the porous pot is always less than in the outside chamber 5. This pressure difference is a positive measure of the CO_2 content of the gas sample and is continuously indicated on the chart 14. The chart 14 is graduated to register the per cent of CO_2 continuously through the movement of the pen, which is actuated by the differential bellows 15 and 16, which are connected respectively to the outside and inside of the porous pot.

Thus when more CO_2 is present in the gas, the greater will be the vacuum inside the porous cup and hence the greater the movement of the pen across the chart. With less CO_2 the less the vacuum and the pen moves back.

Russian Carbonate of Potash

Carbonate of potash (80-85 per cent) imported from Russia is being offered to American consumers by Arcos Limited, 136 Liberty street, New York.

The Arcos Limited is a private company organized under English laws. It is an outgrowth of the All-Russian Co-operative Society, Limited, and its purpose is to promote trade between Russia and other countries. In accomplishing this object the organization at first found itself badly handicapped by the fact that many of the Russian manufacturers and owners of raw materials suitable for export were unable to transact foreign business on account of lack of money for financing production and shipping operations, or because they needed foreign machinery or other materials to enable them to begin production. Arocs, Limited, therefore, when certain goods were required, adopted the policy of advancing to Russian producers a large part of the value of the products wanted, sometimes as high as 75 per cent, the company taking charge of the whole transaction from purchasing and financing to final delivery to the foreign customers.

By this method they have succeeded in building up a substantial trade, their total purchases abroad, as stated by S. Raimist of the New York office, amounting in 1922 to $43,600,000 and sales totaling $24,120,000. Operations of this magnitude require large capital and Arcos, Limited, is capitalized at 1,000,000 pounds sterling fully paid in. Among the many products dealt in besides carbonate of potash are lumber, tar, pitch, lubricating oils, asbestos, graphite, various chemicals and large quantities of foodstuffs and other materials. A booklet giving briefly the main facts about the company and its activities may be obtained from their New York office.

Business Publications

Automatic Glass Pressing and Blowing Machinery. A set of 10 folders has been issued by Edward Miller, proprietor of the Miller Machine & Mold Works, 717 Ann street, Columbus, O., covering the "Edward Miller" line of glass working machinery developed since the business was established 20 years ago. Each folder illustrates and describes a particular machine, or line, as follows: Narrow neck bottle machines, No. 1 narrow neck bottle machine, eight mold pressing machine, wide mouth pressing and blowing machine, 2-A universal pressing and blowing machine, small pressing machine, combination machine for pressed, or pressed and blown ware, paste mold blowing machine, automatic tumbler grinding machine.

The Libbey-Owens Machine in France

Le Verre reports the formation of the Franco-Belgian Society for the Mechanical Manufacture of Glass (Libbey-Owens Process). The head offices of the newly organized company are at Lyon. The capitalization amounts to ten million francs divided into shares of 500 francs, on which a 6 per cent dividend will be paid.

In payment of patent rights, the company has issued 10,000 founders' shares to the International Company for the Mechanical Manufacture of Glass of Brussels. The founders' shares will receive one-half of the profits available after regular dividend payments have been made on the common stock. The company will confine its activities to France and its colonies.

The Glass World and What It Is Doing

News of the Industry

Collective Buying of Plate Glass Proposed for Insurance Companies

In a letter sent to the executives of plate glass insurance companies and printed in the *Journal of Commerce*, New York, a plan is suggested by the Massachusetts Plate Glass Insurance Company of Boston, for reducing the cost of plate glass to the companies by combining their requirements and contracting with the glass manufacturers through a single agency for the total quantity needed. The letter follows:

"We have attended various meetings of the Plate Glass Conference in New York. We feel that the following observations might be useful in bringing about a situation whereby the business of plate glass insurance could be placed upon a durable, sound and profitable basis.

The business of plate glass insurance is primarily one of selling glass. In business dealing with commodities an equipped merchant first takes thought as to the source and cost covering a stated period of the goods he is merchandising. He then is able to determine, on considering all the other facts entering into the merchandising, with some degree of accuracy, what the selling price should be. With cooperative action in the purchasing of supplies obvious advantages may be obtained. With this statement as a premise, why, therefore, would not the following general plan be logical?

(1) To have all the plate glass insurance companies in the conference endeavor to contract through a single medium representing them, with the plate glass manufacturers direct, for the estimated amount of glass they will require the country over, at a given price to cover a stated period. There should be no reason why manufacturers should not be glad to engage in a mutually advantageous proposition with desirable responsible customers using only the highest grade of commercial material.

(2) To establish warehouses at the larger centers for the receiving of glass in charge of a salaried manager and employ glaziers, thereby cutting out intermediate profit and obtaining direct profits on salvage.

(3) To establish exchanges in the larger centres where sizes of glass to be insured can be had without the expense of individual measurements. It would then be possible for the companies to compile rates which would be adequate and do business economically and with comparative safety.

So long as the present policy of hit and miss continues, just so long will the present high loss ratio continue. The solution of this problem lies chiefly in the elimination of needless expense and in knowing as near as possible the actual cost of the goods handled. We should be glad to have your view on the subject."

Directory for the British Glass Industry

The first edition of the new "Directory for the British Glass Industry" compiled by G. S. Duncan, edited by Professor W. E. S. Turner, and published by The Society of Glass Technology, Darnall Road, Sheffield, England, has been issued and is now available. This Directory, containing almost 400 pages 5¼ x 8½ inches in size, will undoubtedly prove to be a most valuable aid to persons who, for business or other reasons, need the information it contains. A vast amount of time and labor must have been spent in compiling the volume and Professor Turner's connection with the work is a sufficient guarantee that it has been well done.

The book is divided into ten sections.

Section A gives the names and addresses and other particulars of glass manufacturers, makers of lamp-worked and scientific articles and optical apparatus, glass manipulators (benders, bevelers, cutters, decorators, grinders, etc.), craftsmen in stained glass, etc.

Section B gives the names, classified according to products manufactured, of the firms entered in Section A.

Section C is devoted to wholesale dealers in glassware.

Section D gives an alphabetical list of firms supplying all kinds of glass making plant equipment, machinery, raw materials, chemicals, refractories, supplies, etc.

Section E gives the names, classified according to products, of firms in Section D.

Section F gives names, addresses, names of officers and other information concerning industrial associations.

Section G gives similar facts regarding trade unions and their officials.

Section H gives a list of and particulars concerning the "Livery Companies" of the City of London.

Section I is devoted to educational institutions, scientific societies, and research associations interested in glass.

Section J gives lists of English and foreign periodicals giving more or less attention to glass, clay, refractories, optics, illuminating engineering and allied subjects.

Notes From Japan

S. Murai, Tokio, engineer of the glass division of the South Manchurian Railway Company, recently started for the United States to attend to some matters in connection with glass machinery.

T. Yamamoto, owner of the Yamatame Glass Company and director of the Japan Mineral Water Bottle Company, has returned with two engineers from a trip to America and Europe during which he investigated the glass industry, visiting numerous factories in different countries.

A shrine was set up at Sumiyoshi on April 22, 1923, by Osaka glass men, for the late Y. Shinjo and three others, in recognition of the great services they had rendered to Japanese glass industries during their lifetime.

For the 29th meeting of the Japanese Ceramic Society, scheduled for April 28, 1923, at Asakusa, Tokyo, Japan, the following program was prepared:

"Roof Tile," by T. Osuka; "Some Investigations of Japanese Porcelain," by Dr. H. Ueda; "Improvement of World Ceramics," by T. Kurahashi; "Inspection of Lucho Island," by J. Kumasawa; "Specifications for Fire Brick," by Dr. S. Kondo; "Corrosive Action of Lead Glass on the Refractory Material," by Dr. S. Satoh, and "How the Ceramic Department of the Tokio Higher Technical School Is Equipped," by R. Shibata.—K. I.

Installing Fourcault Machines

The Jeannette Window Glass Company, Point Marion, Pa., are preparing to re-model their factory No. 2 for the installation of sixteen Fourcault sheet glass drawing machines, which they expect to have in operation by the end of the year. The Fourcault process, which was described in the August 1921 issue of THE GLASS INDUSTRY, is reported to be in successful operation in Belgium, Holland, Bohemia and other European countries. Other concerns in the United States who are installing this process are: Quertinmont Glass Company, Fairchance, Pa., sixteen machines; Blackford Window Glass Company, Vincennes, Ind., sixteen machines; Liberty Glass Company, Clarksburg, W. Va., eight machines, and the Continental Glass Sheet Drawing Company, Shreveport, La., eight machines. It is reported that several other concerns also are considering the adoption of the Fourcault process.

The high and steadily rising costs of building construction had already resulted in the postponement of many important building projects in the East before the recent strike of New York bricklayers for higher wages still further complicated the situation. Official announcement was made in New York early in May that work would be stopped at the top of foundations on a new $11,000,000 29-story telephone building until costs became more reasonable. Columbia University held up a $10,000,000 building program, plans for a $5,000,000 hotel in Brooklyn, fostered by the Chamber of Commerce, were put on the shelf. A new $4,000,000 orphan asylum has been delayed. On May 10, it was reported that at least $60,000,000 worth of construction work was being held up until conditions more favorable to the owners should develop. The bricklayers' strike which started about the middle of May on the jobs of the Mason Builders Association in New York City caused a slow-up of the activities of other building crafts. Up to May 31 the deadlock remained unbroken and nothing but a settlement within a few days can prevent the entire stoppage of work on buildings being erected at a total estimated cost of over $200,000,000.

New Haven Embargo Lifted—J. T. Hendricks, director of traffic, Glass Container Association, on May 17 issued bulletin No. 49, stating that the New York, New Haven & Hartford R. R. had advised that they have cancelled their embargo on all carload freight from all connections at Harlem River, N. Y., Greenville and Jersey City, N. J., Maybrook and Campbell Hall, N. Y.; also on freight originating at Schenectady and Rotterdam Junction, N. Y., and points west thereof when routing via New York Central; also from B. & A. and B. & M. for private siding and team track delivery at Boston, Mass., and from points on or via C. P. or G. T. Ry. for export via piers 31 to 70 East River, N. Y., or Harlem River, N. Y. Less carload freight will only be accepted from connecting lines via Harlem River, N. Y., Greenville and Jersey City, N. J., Campbell Hall and Maybrook, N. Y., or from points beyond B. & A. R. R. routing via that line when loaded in quantities of 20,000 pounds or more for one destination or transfer.

Plate glass to the amount of 19,952,154 square feet was produced in the United States during the first quarter of 1923, according to figures compiled by P. A. Hughes, secretary of the Plate Glass Manufacturers' Association of America. This production compares with 20,941,459 square feet reported for the preceding quarter covering October, November and December. The reduction of 1,000,000 feet in the past quarter was probably caused by time lost in making furnace repairs, etc. Indications are that if the demand continues good the total production for 1923 will break all records. The full effect on the general market of the purchase during the past few months of several of the largest independent factories by automobile interests has not yet been disclosed.

A letter expressing the regrets of the board of trustees of the **American Ceramic Society** that a survey of conditions here and abroad makes it seem unwise for the Society to attempt to organize a party for visiting England and the Continent during the Summer of 1923, and thanking the Society of Glass Technology of England for their kind invitation, was forwarded to F. Greaves Clarke, the Honorable Secretary of the English Society by Ross C. Purdy, secretary of the American Ceramic Society and read at a recent meeting of the English Society, which replied that the invitation remains open for acceptance whenever the Americans can make it convenient to accept it.

Rutgers College, New Brunswick, N. J., has been designated as the location of a new mining experiment station of the Bureau of Mines, which will specialize in problems involved in the production and utilization of the non-metallic minerals. These minerals include bauxite, cement, clay, feldspar, fuller's earth, graphite, gypsum, lime, mica, phosphate rock, salt, sand and gravel, sand-lime, brick, slate, stone, sulphur, mineral paints, garnet, asbestos, and talc. The value of these non-metallic minerals produced annually in the United States is in the neighborhood of a billion dollars. Dr. Oliver Bowles, mineral technologist, has been designated by the Secretary of the Interior as superintendent of the new Rutgers station.

Importers of foreign goods packed in hay, straw, or similar substances, which sometimes contain bacilli of the "mouth disease" common to animals, are urgently requested by the United States Bureau of Animal Industry to immediately destroy these packing materials by burning them as soon as unpacked. Printed pledges to do so have been circulated to which the signatures are asked of importers who will promise to comply with the Government's request. In cases where the original package is forwarded to another destination without unpacking, the shipper is to notify the Inspector in charge of the Bureau of Animal Industry, at New York, giving full particulars of the re-shipment.

The hand operated window glass plants which began to shut down in April were followed in May by many more, production having ceased in a large percentage of the remaining factories. Within a short time practically all hand plants will be closed. Most of those plants which closed early did so because of the impossibility of obtaining sufficient labor to enable them to operate at a profit. The difficulties the manufacturers have had to face during the closing period are feelingly set forth in a letter printed on another page, from C. F. Lutes, president of the Fredonia Window Glass Company, Fredonia, Kans.

The high cost of white arsenic, according to the *Engineering and Mining Journal,* has resulted in the opening up of a gold mine at Jardine, Mont., which had been closed for many years. The ore is of low grade but high in arsenic. The concentrate as received from the mill averages 38 per cent arsenic and contains from two to three ounces of gold per ton. The first shipment of refined white arsenic from the smelter was sold to the Chipman Chemical Engineering Company at a price reported to have been 14½ cents per pound, f. o. b. Bound Brook, N. J. This is the first time on record that ore has been smelted primarily for the production of white arsenic.

A decision in favor of the defendants in the case of the Hartford-Fairmont Company against the United States Glass Company and the Miller Glass Engineering Company was made on May 2 by Judge Schoonmaker, of the United States district court of Western Pennsylvania, who held that two Hitchcock glass feeder patents owned by the plaintiff had never been put to commercial use and had left no impress on the art of feeding molten glass and had not been infringed by the William J. Miller feeder, installed by the Miller Glass Engineering Company in the plant of the United States Glass Company.

Following the granting of a permanent injunction asked for by the affected railroads against the Interstate Commerce Commission and prohibiting the putting into effect of the Commission's recent order compelling the railroads to issue interchangeable mileage books for 2,500 miles at 20 per cent reduction below regular rates, the Commission, pending the outcome of further litigation, has postponed the date for putting its original order into effect until January 1, 1924, hoping that by that time the courts will have settled the question permanently.

An investigation into the cast polished plate glass industry, under section 315 of Title III of the Tariff Act of 1922 has been ordered by the United States Tariff Commission as a result, it is reported, of the application of Buckley-Newhall Company, New York, and McKim and Cochran Furniture Co., Madison, Ind., for a reduction of duty on mirror plate. The date for the first hearing has not yet been announced.

At the annual meeting of the Society of Glass Technology, England, on April 18, 1923, the following officers were elected for the ensuing year:

President, Prof. W. E. S. Turner; vice-presidents, E. A. Coad-Pryor, and W. J. Gardner; ordinary members of Council, F. F. S. Bryson, Violet Dimbleby, Major G. V. Evers, Col. S. C. Halse, Th. Teisen; treasurers, Joseph Connolly (General), Wm. M. Clark, Ph. D. (American); secretary, S. English; auditors, Edward Meigh and Dennis Wood.

In the arsenic situation, not much change has taken place lately. At the end of May importations were arriving in fair quantity and the market was showing slight weakness though holders of stocks did not seem anxious to release them. Spot orders for white arsenic were dull at 14¾ to 15 cents a pound. For delivery the second half of the year quotations were around 11 cents.

Coming Meetings and Events

The annual convention of the American Flint Glass Workers' Union will be held in Baltimore, Md., July 2.

The annual meeting of the National Lime Association will be held June 13, 14 and 15 at the Hotel Commodore, New York.

It is expected that the next meeting of the National Glass Distributors' Association will be held at the William Penn Hotel, Pittsburgh, Pa., early in December.

The Ninth National Exposition of Chemical Industries will be held at the Grand Central Palace, New York, during the week of September 17 to 22, inclusive.

The Twenty-sixth annual meeting of the American Society for Testing Materials will be held at Chalfonte-Haddon Hall, Atlantic City, N. J., during the week of June 24, 1923.

The next National Foreign Trade Convention, according to James A. Farrell, chairman of the National Foreign Trade Council and president of the United States Steel Corporation, will be held at Boston, Mass., probably during May, 1924.

A meeting of the members of the Glass Container Association will be held at the Marlborough-Blenheim Hotel, Atlantic City, N. J., on July 27. At a meeting held in the same place on April 27, President Root presided over a large gathering of members.

At a preliminary wage conference of the National Glass Bottle Manufacturers' Association and the National Glass Blowers' Association of the United States and Canada at Atlantic City, N. J., early in May, the workers' representatives asked for an increase in wages of 20 per cent., while the manufacturers asked for a reduction without specifying the amount. The situation will be discussed at the annual conference to be held early in August at Atlantic City, N. J.

Official notification has been received that the Fourth International Sample Fair will be held at Reichenberg, Czechoslovakia, from August 11 to August 19, 1923. Products of Czechoslovakian manufacture suitable for export will be exhibited. Bohemian fancy and household and porcelain glassware will be featured. Other special lines are textiles, Gablonz imitation jewelry, lighting fixtures, ceramics, technical and chemical products.

A call for a convention of window glass cutters to be held in the Y. M. C. A. building at Charlestown, W. Va., from June 26 to 30, has been issued by William G. Kirchenbower, president of the Window Glass Cutters' League of America. The purpose of the convention is to discuss the new conditions created by the increase in the use of automatic sheet glass drawing machines, and a proposal will be made to centralize the membership of all window glass cutters of the United States in the Window Glass Cutters' League of America.

The third Chicago exhibit of glass, pottery, lamps and housefurnishings will be held at the Hotel Sherman, Chicago, Ill., July 9 to 21. Four floors of the hotel have been reserved and Chicago members of the association will make displays in their permanent show rooms, making altogether the largest and most comprehensive display of this class of merchandise ever held in Chicago. Full particulars of the exhibit may be obtained from the Glass, Pottery, Lamps and Housefurnishings Association, 9 North Wabash avenue, Chicago, Ill.

The National Association of Manufacturers of Pressed and Blown Glassware will have its next meeting at Atlantic City, N. J., July 16 and 17. On July 18, negotiations will be begun by the wage committee with representatives of the American Flint Glass Workers' Union for the purpose of arranging the wage scale for the fiscal year ending June 30, 1924. The conference will continue from day to day until the work is completed. Late in July or early in August a similar conference will be held with the representatives of the National Bottle Manufacturers' Association.

Verified News of Trade Activities

The Rugby Glass Works, Brooklyn, N. Y., has been incorporated with a capital of $10,000, by J. G. Gordon, R. and M. Napack.

A. E. Myers Company, glass factory engineers, have moved from 8 Wood Street to 1417 Allegheny Avenue, North Side Station, Pittsburgh, Pa.

A. F. Goyette, secretary of the **Reliance Window Glass Manufacturing Company,** Dubois, Pa., stated recently that the company will install window glass machines early in the fall.

The Combustion Utilities Corporation, furnace and appliance division, has moved its branch office at Toledo, O., from 327 South Erie street to 2288 Albion street.

The J. N. Nurre Mirror Company of Bloomington, Ind., has purchased the plant of the Chattanooga Mirror Plate Company, of Chattanooga, Tenn., at a cost of about $50,000.

Hawthorne Glass Company, 3650 52nd avenue, Cicero, Ill.; glass products; 500 shares of stock, no par value. Incorporators: F. H. King, Thomas J. Harper and E. A. Moynihan.

The Reliance Window Glass Co., Du Bois, Pa., suffered a heavy loss by fire one May 22, when their box factory and cutting room were destroyed and a large stock of glass ready for packing was damaged.

The Mirror Manufacturers' Association held its regular spring meeting at the William Penn Hotel, Pittsburgh, Pa., May 1 and 2. There was a good attendance of members. The date for holding the next meeting was left open.

The factory of the **Royal Window Glass Company,** East Grafton, W. Va., which has practically been rebuilt, will, it has been announced by W. G. Hammond, general manager, be ready for operation early in July.

The furnaces have been fired at the plant of the **Essex Glass Company,** Parkersburg, W. Va., and it is expected that operation will be resumed early in June. The factory has been closed for the past six or seven weeks.

The Safetee Glass Company of Canada, Ltd., Ottawa, Ont., has been incorporated to manufacture and deal in glass, etc. The capital stock is $500,000 and the incorporators: Allan J. Fraser, Redmond Code, Harry Beer, and others.

The Owens Bottle Company, Toledo, O., reports for the March quarter net profits of $907,361, equal, after preferred dividends, to $1.13 a share (par $25) on $16,531,200 common stock, against $646,948, or 73 cents a share in the first quarter of 1922.

The glass plant of **Pilkington Bros., Ltd.,** at Thorold, Ont., Canada, which has been closed down for about a year, has been opened and it is expected will gradually be brought into complete operation, giving employment, at capacity, to several hundred workers.

The United States Window Glass Company, Morgantown, W. Va., according to press reports, has arranged for a bond issue of $350,000, a portion of the proceeds to be used for the installation of additional power equipment and other machinery, including gas producers, etc. Walter A. Jones is president.

The American Glass Company, glass jobbers and mirror manufacturers, Knoxville, Tenn., which was recently organized with a capital of $25,000, will erect a new steel and concrete building containing 22,000 feet of floor space. The officers of the company are L. J. Marlin, president and H. G. Kinney, vice-president.

The garnet deposits of the **Garnet Grit Company,** near Danbury, N. H., are reported to have been sold to the **Ford Motor Company,** who intend to install new pulverizing, grinding and refining equipment and increase the output of the plant. The product is to be used in the Ford Company's recently acquired plate glass factory at Glassmere, Pa., and in the Company's Detroit plant.

At a meeting of the board of directors of the **United States Sheet and Window Glass Company,** Toledo, O., held after the annual meeting of the stockholders on April 16, the following board of directors and officers were elected for the ensuing year:

Officers: E. D. Libbey, president; M. J. Owens, vice-presi-

dent; J. C. Blair, vice-president; B. C. Root, vice-president and general manager; C. T. Mahan, assistant general manager; A. E. Fowle, treasurer and assistant secretary; C. J. Wilcox, secretary; J. M. Neenan, factory manager. Directors: E. D. Libbey, M. J. Owens, J. C. Blair, H. L. Hollis, N. C. McGowen, B. C. Root, A. E. Fowle, Wm. Ford, W. A. Jones.

Uehling Instrument Co., Paterson, N. J., manufacturers of Co_2 recorders and draft and vacuum gauges, have just made two important agency appointments, namely Amsler-Morton Co., Fulton Building, Pittsburgh, Pa., for Western Pennsylvania and John A. MacDowell, 2039 Railway Exchange Building, St. Louis, Mo., for eastern Missouri and Southern Illinois.

A special meeting of the stockholders of the **Houze Window Glass Company,** Point Marion, Pa., was called by W. H. Board, secretary, for May 29, 1923, for the purpose of obtaining the consent of the stockholders to a certain agreement of merger and consolidation entered into between the directors of the Houze Window Glass Company, the directors of the **Federated Glass Company** and the directors of the **L. J. Houze Convex Glass Company.**

A building in which were located four tanks of the **Whitall-Tatum Company,** Millville, N. J., was practically destroyed by fire the night of May 3. Temporary arrangements were made so that two of the furnaces were soon working again and the Company announced that it would be able to take care of its business as usual. Practically all of the several hundred employees thrown out of work were taken care of by the resumption of work in these furnaces and in other parts of the plant that were not affected by the fire.

The Brilliant Glass Company, Brilliant, O., recently organized by Leroy F. Duke, president; W. J. Mathews, Jr., vice-president, and W. W. Mathews, treasurer and general manager, and which acquired a power plant vacated by the Wheeling Traction Company, announces that the remodeling of the building, which is 100 by 150 feet, is nearing completion and that the plant is expected to be in operation early in June. One six-ring tank for ruby glass, one six-ring tank for signal green glass, and one four-ring tank for crystal glass, as well as three lehrs have been installed. All equipment is stated to be of the latest design. The company will specialize in automobile and railroad lenses, hardware and furniture glassware, advertising specialty ware, etc., and W. W. Mathews reports that the company has contracted with the Perkins Marine Lamp Corporation, of Brooklyn, N. Y., to take care of their ruby, signal green and crystal glass requirements for the next ten years. Mr. Duke, as well as being president of the Company, will have charge of the general sales office at 39 Cortlandt street, New York.

Personal

Alanson B. Houghton, United States Ambassador to Germany and one of the directors of the Corning Glass Works, Corning, N. Y., returned from Germany on May 11 on the steamer *George Washington.*

R. F. Brenner, chemist of the H. C. Fry Glass Company, Rochester, Pa., on May 11 gave the students of Geneva College a talk on the manufacture of glass from the chemical standpoint.

Dr. George K. Burgess has been appointed Director of the Bureau of Standards, Washington, D. C., succeeding Dr. S. W. Stratton who had successfully directed the department for many years and who recently resigned to become president of the Massachusetts Institute of Technology. Dr. Burgess, the new Director, was head of the metallurgical division of the Bureau for several years.

A complimentary dinner was tendered to **Marion G. Bryce,** president of the United States Glass Company, at the William Penn Hotel, Pittsburgh, Pa., on the evening of May 22, by H. G. Turner, of Boston, Mass., who was instrumental in the recent financial reorganization of the company, and represents the Eastern stock holders. The dinner was attended by about 125 employees of the company, including Reuben Haley, general manager; Ernest Nickel, treasurer, both of whom with Mr. Turner and Mr. Bryce addressed the guests.

Deaths

William J. Lytle

William J. Lytle, chief engineer of the H. L. Dixon Company, Pittsburgh, Pa., died on May 21, of peritonitis which resulted from an attack of appendicitis. He was forty-one years of age. During his many years in the glass trade Mr. Lytle, whose home was in Rosslyn Farms, Pa., made hosts of friends who will sadly miss him. His widow, two daughters and two sons survive him as do also his parents, a sister and five brothers.

Ernest C. Klipstein

Ernest C. Klipstein, secretary-treasurer of A. Klipstein & Company, New York, manufacturers and importers of chemicals, died on April 29. Mr. Klipstein was also connected with a number of other concerns interested in the manufacture and importation of chemicals.

Inquiries Received

131.—We are in the market for glass grinding machinery, and machinery for the manufacture of store fixtures and show cases.

132.—(From Japan). Please let me have the addresses of firms manufacturing plate glass producing machinery.

133.—We would like the names of manufacturers of tissue paper in white, red and green, for use in wrapping glass lenses.

134 (from Canada).—We would like the names of manufacturers in the United States who are making a specialty of glass vials for perfumery.

135.—In the manufacture of indicators we use curved glass. Will you kindly tell us the names of concerns in the vicinity of New York who may be able to supply our requirements.

136.—Kindly give us addresses of firms making water stills of about ten and fifteen gallons capacity per day.

137.—What concerns would manufacture for us electric condensers consisting of plates of metal (which we will furnish) of practically the same co-efficient of expansion as glass, embedded in blocks of glass.

Stock Quotations

(Reported by Moore, Leonard & Lynch, Frick Building, Pittsburgh, Pa.)

PITTSBURGH STOCK EXCHANGE—MAY 24, 1923

	Bid	Ask	Last
American Window Glass Machine, com...	80	82	80
American Window Glass Machine, pref...	92	93	92
American Window Glass Preferred.....	107	..	107
United States Glass.....	27	28	27
Pittsburgh Plate Glass.....	..	170	169

During the past month a quiet tone has prevailed throughout the glass market. All the issues held about the same price level with the exception of American Window Glass Machine common, which developed a weakening in the price level due to market conditions. All the companies reported satisfactory earnings and it is the general impression that 1923 will prove a record year in the glass industry.

WHEELING STOCK EXCHANGE—MAY 24, 1923

	Bid	Ask	Last
Hazel Atlas	39½	40	40
Imperial Glass	98	100	99½
Fostoria Glass	138	140	140
Central Glass	90	100	90

The Wheeling glass market has been generally quiet during the last month with the exception of Hazel-Atlas, which was quite active. This company is reported to have had a record month in April and every indication at the present time is that the year 1923 will show a 33 per cent increase in sales over 1922. Central has been especially quiet during the past month, the other issues holding about the same level as formerly.

TOLEDO STOCK EXCHANGE—MAY 24, 1923

	Bid	Ask	Last
Owens Bottle	43½	..	43½
Owens Bottle Preferred.....	107	114	110
Libbey-Owens Sheet Glass, common.....	134	138	135
Libbey-Owens Sheet Glass Preferred.....	104	106	...

Current Prices of Glass-Making Materials

From quotations furnished by various manufacturers and dealers

May 25, 1923

		Carlots	Less Carlots
Aluminum hydrate ($Al(OH)_3$)	lb.	.04½	.05
Aluminum oxide (Al_2O_3)	lb.	.06½	.07
Antimony oxide (Sb_2O_3)	lb.	.07	.07½
Arsenic trioxide (dense white), 99% (As_2O_3)	lb.	.14¾	.15
Barium carbonate ($BaCO_3$)	ton	70.00	90.00
Barium hydrate ($Ba(OH)_2$)	lb.	.05½	.05¾
Bone ash	lb.	.07	.07½
Borax ($Na_2B_4O_7\,10H_2O$)	lb.	.05½	.06
Borax, fused, any mesh ($Na_2B_4O_7$)	lb.	.19	.20
Boric acid, fused (B_2O_3)	lb.	.35	.35
Cadmium Sulphide, red (CdS)	lb.	..	1.65
Cadmium Sulphide, orange	lb.	..	1.65
Cadmium Sulphide, yellow (CdS)	lb.	..	1.85
Chrome oxide	lb.	.35	.36
Cobalt oxide, in bbls. (Co_2O_3)	lb.	..	2.10
Cobalt oxide, in 10 lb. tins (Co_2O_3)	lb.	..	2.20
Copper oxide, red	lb.	..	.15-.16
Copper oxide black (CuO)	lb.	..	.26
Copper oxide, black prep'd (CuO)	lb.	..	.30
Cryolite (Na_3AlF_6)	lb.	.09	.10½
Feldspar, 100 mesh	ton	11.50-16.00	20.00
Fluorspar, powdered white, 95% (CaF_2)	ton	48.00	60.00
Fluorspar, powdered white, 90% (CaF_2)	ton	45.00	55.00
Hydrofluoric acid (HF) 60% (in lead carboys)	lb.	.13	..
Kaolin (f.o.b. mine)	ton	10.00	20.00
Lead oxide (red lead) (Pb_3O_4)	lb.	.11½	.11¾
Litharge (PbO)	lb.	.11	.11¼
Lime—			
Hydrated (in 50 lb. paper sacks) ($Ca(OH)_2$)	ton	12.50	..
Burnt, ground, in bulk (CaO)	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground in 280 lb. bbls. per bbl.		2.15	2.30
Manganese 85% (MnO_2)	lb.	.03½	.04
Nickel oxide, black (Ni_2O_3) for nickel content	lb.	.32	..
Nickel monoxide, green (NiO) for nickel content	lb.	.30	..
Potassium carbonate—			
Calcined 90% (K_2CO_3)	lb.	.06¼	.06½
Hydrated 90% (KOH)	lb.	.07	.07¾
Potassium nitrate (KNO_3) (gran.)	lb.	.06½	.06¾
Potassium Permanganate ($KMnO_4$)	lb.	..	.17
Powdered blue	lb.	..	.24-.26
Powdered blue (std. formula)	lb.	..	.38
Salt cake, glassmakers, f. o. b. works (Na_2SO_4)	ton	25.00-28.00	30.00-35.00
Selenium (Se)	lb.	..	2.10-2.85
Soda ash, 58% dense, 48% basis			
Bulk (Na_2CO_3)	100 lb.	1.22½	..
Bulk, on contract (Na_2CO_3)	100 lb.	1.17½	..
Sodium nitrate, refined ($NaNO_3$)	lb.	..	.04¾-.05¼
Sodium selenite (Na_2SeO_3)	lb.	1.90	2.00-2.50
Sodium Fluosilicate (Na_2SiF_6)	lb.	.07¾	.08
Sulphur (S) (flowers)—in bbls.	per 100 lb.	3.25	3.55-3.80
Sulphur (flowers) Bags	per 100 lb.	3.00	3.30-3.55
Sulphur (S) (flour, heavy), in bbls.	per 100 lb.	2.50	3.00
Uranium oxide—100 lb. lots (UO_3)	lb.	..	2.25
Zinc oxide (ZnO)	lb.	.08¼	.08½

Monthly Summary of United States Foreign Commerce in Glass

Exports

Corrected to May 5, 1923

	March 1922 Quantity	March 1922 Value	March 1923 Quantity	March 1923 Value	Nine Months Ending February 1922 Quantity	Nine Months Ending February 1922 Value	Nine Months Ending February 1923 Quantity	Nine Months Ending February 1923 Value
Glass and glass products (total)	.....	$707,302	.....	$857,391	.....	$6,432,115	.....	$6,854,324
Plate and window glass—								
Window glass, common, box 50 sq. ft.	3,793	$18,028	2,120	$12,125	16,511	$98,670	23,045	$131,582
Plate glass, unsilvered, sq. ft.	291,892	127,067	148,262	58,575	1,771,615	800,495	1,590,236	617,969
Other window and plate glass, n. e. s. lbs.	219,019	22,419	296,430	32,079	[2]467,365	[2]45,457	2,216,592	234,554
Glass containers (bottles, vials and jars) lbs.	2,873,098	168,477	5,219,714	261,156	.....	1,763,747	40,455,123	2,065,187
Table glassware, plain lbs.	720,779	91,127	1,648,087	166,122	[1]1,507,977	[2]209,296	13,447,127	1,400,860
Table and other glassware, cut or engraved lbs.	30,863	15,752	49,299	19,662	.....	91,110	423,463	165,040
Glassware for lighting—								
Lamp chimneys and lantern globes lbs.	129,907	27,239	184,111	37,429	[2]327,139	[2]68,653	1,151,426	224,749
Globes and shades for lighting fixtures lbs.	83,400	29,787	110,876	39,561	[2]286,647	[2]88,942	1,170,737	332,877
Lamps and other illuminating devices, chiefly of glass lbs.	139,482	45,626	171,696	42,398	[2]316,215	[2]125,246	879,822	267,543
Chemical glassware lbs.	13,470	9,009	15,783	17,258	.....	118,876	157,088	106,709
Electrical glassware, except for lighting lbs.	82,473	16,043	315,657	24,301	[2]306,281	[2]48,647	2,296,352	150,279
Other glassware, n. e. s. lbs.	1,833,240	136,728	894,048	146,725	.....	2,972,976	6,470,249	1,156,975

[2]Jan. 1 to March 31.

Imports

[NOTE—Owing to continued delay in the compilation of import figures the report for January given below is the latest available.]

Corrected to May 4, 1923

	January 1922 Quantity	January 1922 Value	January 1923 Quantity	January 1923 Value	Seven Months Ending January 1922 Quantity	Seven Months Ending January 1922 Value	Seven Months Ending January 1923 Quantity	Seven Months Ending January 1923 Value
Glass (total)	.....	$691,585	.....	$1,502,288	.....	$5,205,482	.....	$9,757,072
Cylinder, crown, and sheet, lbs. dut.	2,609,304	$126,254	.....	.....	24,021,052	$1,197,918	[1]12,319,638	[1]$560,973
Unpolished, lbs. dut.	.....	.....	3,037,521	$135,732	.....	.....	[2]14,291,731	[2]633,208
Bent, ground, beveled, colored, painted, etc., and polished dut.	.....	.....	.....	33,120	.....	.....	.....	[2]242,408
Plate glass—								
Unsilvered, sq. ft. dut.	454,051	232,853	1,743,088	865,248	2,174,229	1,210,284	9,282,843	4,505,146
Fluted, rolled, etc., or silvered, or containing wire netting, sq. ft. dut.	.....	.....	245,655	48,723	.....	.....	[2]769,244	[2]143,627
Containers—bottles, vials, etc. dut.	.....	13,805	.....	35,716	.....	219,212	.....	200,887
Table and kitchen utensils, lbs. dut.	.....	.....	58,699	21,772	.....	.....	[2]397,775	[2]151,856
Glassware, cut or decorated, lbs. dut.	.....	132,575	138,736	78,338	.....	934,329	.....	1,139,713
Blown glassware, n. e. s., lbs. dut.	.....	.....	414,504	69,870	.....	.....	[2]1,897,751	[2]440,011
Other glassware dut.	.....	9,515	.....	.....	.....	172,772	.....	144,253
Other glassware free	.....	176,583	.....	213,769	.....	1,470,967	.....	1,694,990

[1]July 1 to Sept. 21. [2]Beginning Sept. 22.